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[COMMITTEE PRINT]

ASTRONAUTS AND COSMONAUTS
BIOGRAPHICAL AND STATISTICAL DATA

[Revised—May 31, 1976]

REPORT

PREPARED FOR THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
NINETY-FOURTH CONGRESS
SECOND SESSION

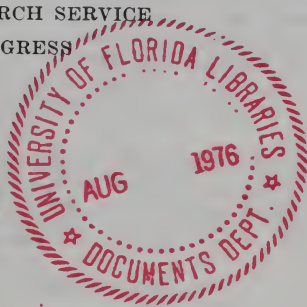
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Washington, D.C., May 27, 1976.

HON. OLIN E. TEAGUE,
Chairman, Committee on Science and Technology,
U.S. House of Representatives,
Washington, D.C.

DEAR MR. CHAIRMAN: Pursuant to discussions with your committee staff, the enclosed revised version of "Astronauts and Cosmonauts: Biographical and Statistical Data" is transmitted herewith. The year 1976 not only marks the 200th anniversary of our Nation, but the 15th anniversary of our first manned space voyage, that of Alan Shepard on May 5, 1961.

Every effort has been made to update information on all the present and former astronauts of NASA, the X-15 joint NASA-Air Force program, the Air Force X-20 Dyna-Soar program and the Air Force Manned Orbiting Laboratory program, as well as the Soviet cosmonauts. Inevitably, a few records may be out of date despite this effort, especially for the cosmonauts since information is so difficult to obtain, but the report is current to May 31, 1976 to the best of our knowledge.

The report was again prepared by Ms. Marcia Smith, Analyst in Science and Technology, Science Policy Research Division. She appreciates the assistance of Charles Vick, Maarten Houtman of the Netherlands, and the Air Force in obtaining some of the photographs used.

Sincerely,

NORMAN BECKMAN,
Acting Director.

CONTENTS

	Page
Letter of Submittal.....	III
1. National Aeronautics and Space Administration Astronauts.....	1
Table 1-1: Status of Astronauts by Group.....	1
Biographies of Astronauts.....	3
Table 1-2: Summary of NASA Astronauts.....	76
2. The X-15, X-20 Dyna-Soar and Manned Orbiting Laboratory Pro- grams.....	81
Biographies of X-15, X-20 Dyna-Soar and MOL Astronauts.....	83
Table 2-1: Summary of X-15, X-20 and MOL Astronauts.....	114
3. Soviet Cosmonauts.....	117
Table 3-1: Probable Soviet Cosmonaut Corps Groups.....	118
Biographies of Soviet Cosmonauts.....	120
Table 3-2: Summary of Soviet Cosmonauts.....	160
4. Comparative Data on American and Soviet Spaceflights.....	163
Table 4-1a: U.S. and U.S.S.R. Manned Spaceflights.....	164
Table 4-1b: Time Line of U.S. and U.S.S.R. Manned Space mis- sions.....	170
Table 4-2a: U.S. Manned Spaceflight Crew Members by Program.....	171
Table 4-2b: U.S.S.R. Manned Spaceflight Crew Members by Pro- gram.....	174
Table 4-3: Comparative Time Spent on Space Missions.....	176
Table 4-4: Manned Spaceflights by Program.....	178
Table 4-5: Summary Table of U.S. Astronaut Program.....	179
Table 4-6: List of Deceased Astronauts and Cosmonauts.....	180

CHAPTER ONE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ASTRONAUTS

There have been seventy-three astronauts chosen by NASA since April 1959. As of May 1975 there will be twenty-eight on active duty, thirty-four resigned, three on inactive status, and eight deceased. Those classified inactive in this report (Allen, Schweickart, and Swigert) are so identified by NASA and remain a part of the astronaut corps as long as they work for the Government and continue their flying status.

The astronauts were chosen in groups, and to date there have been seven groups selected: Group I, April 9, 1959, 7 chosen; Group II, September 17, 1962, 9 chosen; Group III, October 18, 1963, 14 chosen; Group IV, June 28, 1965, 6 chosen; Group V, April 4, 1966, 19 chosen; Group VI, August 4, 1967, 11 chosen; Group VII, August 14, 1969, 7 transfers from the cancelled Manned Orbiting Laboratory program.

TABLE 1-1
STATUS OF ASTRONAUTS BY GROUP

Group I—1959 (Mercury pilots)

Carpenter.....	Resigned.
Cooper.....	Do.
Glenn.....	Do.
Grissom.....	Deceased (Apollo 204).
Schirra.....	Resigned.
Shepard.....	Do.
Slayton.....	Active.

Group II—1962 (pilot-astronauts)

Armstrong.....	Resigned.
Borman.....	Do.
Conrad.....	Do.
Lovell.....	Do.
McDivitt.....	Do.
See.....	Deceased (T-38 crash).
Stafford.....	Resigned.
White.....	Deceased (Apollo 204).
Young.....	Active.

Group III—1963 (pilot-astronauts)

Aldrin.....	Resigned.
Anders.....	Do.
Bassett.....	Deceased (T-38 crash).
Bean.....	Active.
Cernan.....	Resigned.
Chaffee.....	Deceased (Apollo 204).
Collins.....	Resigned.
Cunningham.....	Do.
Eisele.....	Do.
Freeman.....	Deceased (T-38 crash).
Gordon.....	Resigned.
Schweickart.....	Inactive.
Scott.....	Resigned.
Williams.....	Deceased (T-38 crash).

Group IV—1965 (scientist-astronauts)

Garriott.....	Active.
Gibson.....	Resigned.
Graveline.....	Do.
Kerwin.....	Active.
Michel.....	Resigned.
Schmitt.....	Do.

Group V—1966 (pilot-astronauts)

Brand.....	Active.
Bull.....	Resigned.
Carr.....	Active.
Duke.....	Resigned.
Engle.....	Active.
Evans.....	Do.
Givens.....	Deceased (auto accident).
Haise.....	Active.
Irwin.....	Resigned.
Lind.....	Active.
Lousma.....	Do.
Mattingly.....	Do.
McCandless.....	Do.
Mitchell.....	Resigned.
Pogue.....	Active.
Roosa.....	Resigned.
Swigert.....	Inactive.
Weitz.....	Active.
Worden.....	Resigned.

Group VI—1967 (scientist-astronauts)

Allen.....	Inactive.
Chapman.....	Resigned.
England.....	Do.
Henize.....	Active.
Holmquest.....	Resigned.
Lenoir.....	Active.
Llewellyn.....	Resigned.
Musgrave.....	Active.
O'Leary.....	Resigned.
Parker.....	Active.
Thornton.....	Do.

Group VII—1969 (ex-MOL astronauts)

Bobko.....	Active.
Crippen.....	Do.
Fullerton.....	Do.
Hartsfield.....	Do.
Overmyer.....	Do.
Peterson.....	Do.
Truly.....	Do.



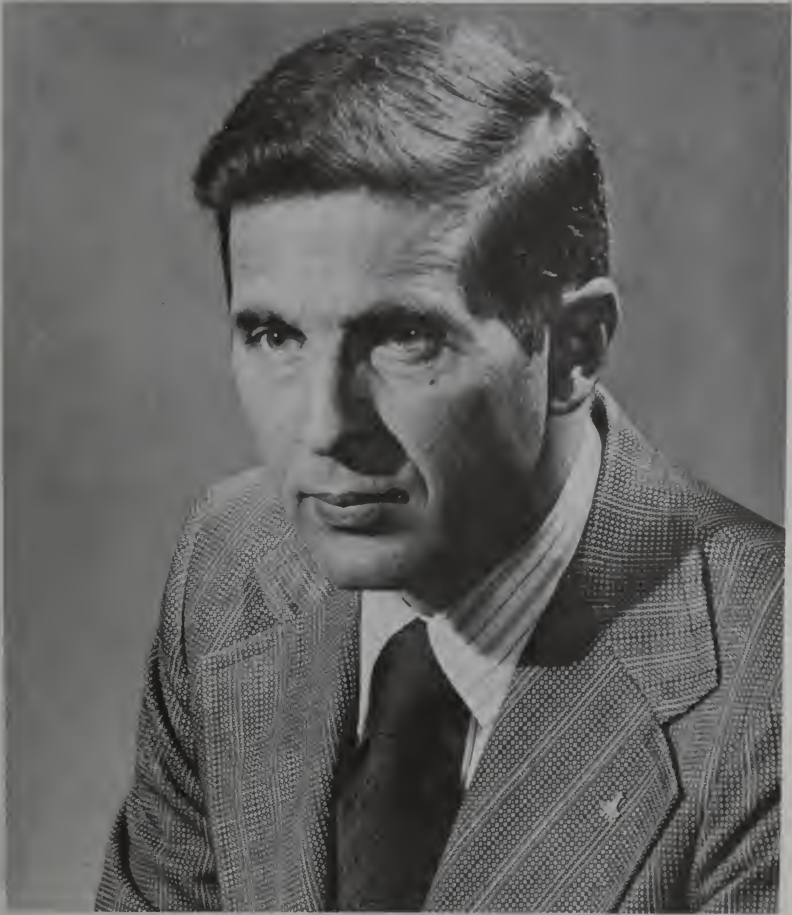
Edwin "Buzz" Eugene Aldrin, Jr.; Colonel, USAF (Retired); born January 20, 1930, Montclair, New Jersey; divorced, three children, subsequently remarried.

Received bachelor of science degree from the U.S. Military Academy (1951), doctor of science in astronautics from the Massachusetts Institute of Technology (1963), and was chosen with the third group of astronauts in 1963. Colonel Aldrin was backup pilot for Gemini 9, pilot for Gemini 12, backup command module pilot for Apollo 8, and lunar module pilot for Apollo 11 (second man to walk on Moon). He retired from NASA in July 1971 to become commandant of the Aerospace Research Pilots' School at Edwards Air Force Base, California. On March 1, 1972 he retired from the Air Force and is now President of Research and Engineering Consultants in California. His book, *Return to Earth*, describes some post-flight experiences and problems encountered by many astronauts.



Joseph Percival Allen IV; civilian; born June 27, 1937, Crawfordsville, Indiana; married, two children.

Received bachelor of arts degree in math-physics from DePauw University (1959), master of science in physics from Yale University (1961), doctorate of nuclear physics from Yale (1965), and was chosen with the sixth group of astronauts in 1967. He was mission scientist for Apollo 15 and took a temporary leave from NASA in 1973 to serve on the staff of the President's Council on International Economic Policy. He participated in the Outlook for Space study and currently is Assistant Administrator for Legislative Affairs at NASA headquarters.



William Alison Anders; Colonel, USAFR; born October 17, 1933, Hong Kong, China; married, six children.

Received bachelor of science degree from U.S. Naval Academy (1955), master of science in nuclear engineering from the Air Force Institute of Technology (1962), and was chosen with the third group of astronauts in 1963. Colonel Anders was backup pilot for Gemini 11, lunar module pilot for Apollo 8, and backup command module pilot for Apollo 11. He retired from the Air Force in September 1969 and became Executive Secretary of the National Aeronautics and Space Council. In 1973 he joined the Atomic Energy Commission, and with its reorganization in 1974, became chairman of the Nuclear Regulatory Commission. He resigned that position in the spring of 1976 and was recently confirmed as U.S. Ambassador to Norway.



Neil Alden Armstrong; civilian; born August 5, 1930, Wapakoneta, Ohio; married, two children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1955), was an aviator in the U.S. Navy, received master of science in aerospace engineering from the University of Southern California (1970), and was chosen with the second group of astronauts in 1962. Prior to his selection, Mr. Armstrong was engaged in the X-15 program. He was backup command pilot for Gemini 5, command pilot for Gemini 8, backup command pilot for Gemini 11, backup commander for Apollo 8, and commander for Apollo 11 (first man to walk on Moon). In July 1970 he became Deputy Associate Administrator for Aeronautics at NASA. In August 1971 he resigned that position and is currently Professor of Aeronautical Engineering at the University of Cincinnati.



Charles Arthur Bassett II; Major, USAF; born December 30, 1931, Dayton, Ohio; died February 28, 1966 near St. Louis, Missouri in the crash of a T-38 jet; was married, two children.

Received a bachelor of science in electrical engineering from Texas Technological College and was selected with the third group of astronauts. Major Bassett had been chosen to pilot Gemini 9.



Alan LaVern Bean; Captain, USN; born March 15, 1932, Wheeler, Texas; married, two children.

Received a bachelor of science degree in aeronautical engineering from the University of Texas (1955), and was chosen with the third group of astronauts in 1963. Captain Bean was backup command pilot for Gemini 10; backup lunar module pilot for Apollo 9, lunar module pilot for Apollo 12 (fourth man to walk on Moon), commander for Skylab 3, and was backup commander for the Apollo-Soyuz Test Project. He is currently assigned to space shuttle development.



Karol Joseph Bobko; Lieutenant Colonel, USAF; born December 23, 1937, New York, New York; married, two children.

Received bachelor of science degree from the U.S. Air Force Academy (1959), master of science in aerospace engineering from the University of Southern California (1970), and transferred into the astronaut corps from the MOL program in 1969. He was a crew member of the Skylab Medical Experiments Altitude Test and was part of the support crew of the Apollo-Soyuz Test Project. He is currently assigned to space shuttle development.



Frank Borman; Colonel, USAF (Retired); born March 14, 1928, Gary, Indiana; married, two children.

Received bachelor of science degree from the U.S. Military Academy (1950), master of science in aeronautical engineering from the California Institute of Technology (1957), and was chosen with the second group of astronauts in 1962. Colonel Borman was backup command pilot of Gemini 4, command pilot for Gemini 7, and commander for Apollo 8. In May 1967 he became Field Director of the Long-Term Space Station Program at NASA. He resigned from NASA and the Air Force on July 1, 1970 to become Senior Vice-President, Operations Group for Eastern Airlines, and was recently promoted to President and chief operating officer.



Vance DeVoe Brand; civilian; born May 9, 1931, Longmont, Colorado; married, four children.

Received bachelor of science degree in business administration from the University of Colorado (1953), bachelor of science in aeronautical engineering from the University of Colorado (1960), master of business administration from the University of California at Los Angeles (1964), served as an aviator with the U.S. Marine Corps, and was chosen with the fifth group of astronauts in 1966. Mr. Brand was backup command module pilot of Apollo 15, backup commander for Skylab 3 and Skylab 4, and was command module pilot for the Apollo-Soyuz Test Project. He is currently assigned to space shuttle development.



John Sumter Bull; Lieutenant Commander, USN (Retired); born September 25, 1935, Memphis, Tennessee; married, one child.

Received a bachelor of science degree in mechanical engineering from Rice University (1957) and was chosen with the fifth group of astronauts in 1966. Commander Bull withdrew from the astronaut program and the Navy in 1968 due to a rare pulmonary disease. He is currently working toward a doctorate at Stanford University



Malcolm Scott Carpenter; Commander, USN (Retired); born May 1, 1925, Boulder, Colorado; divorced, four children, subsequently remarried.

Attended University of Colorado although not graduating (awarded an earned degree in engineering after his space flight), and was chosen in the first group of astronauts in 1959. Commander Carpenter was backup pilot for Mercury-Atlas 6 (Friendship 7), and the pilot of Mercury-Atlas 7 (Aurora 7). An elbow injury from a motorbike accident in Bermuda in 1964 removed him from flight status, and he resigned from NASA in August 1967 to join the U.S. Navy Project Sealab. He retired from the Navy on July 1, 1969 and is in private business in Los Angeles, California.



Gerald Paul Carr; Colonel, USMC (Retired); born August 22, 1932, Denver, Colorado; married, six children.

Received bachelor of science degree in mechanical engineering from the University of Southern California (1954), bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1961), master of science in aeronautical engineering from Princeton University (1962), and was chosen with the fifth group of astronauts in 1966. Colonel Carr was instrumental in the development of the lunar roving vehicle used by the Apollo astronauts, and was commander of Skylab 4. Currently he is assigned to space shuttle development.



Eugene Andrew Cernan; Captain, USN; born March 14, 1934, Chicago, Illinois; married, one child.

Received bachelor of science degree in electrical engineering from Purdue University (1956), master of science in aeronautical engineering from Purdue and the Naval Postgraduate School (1961), and was chosen in the third group of astronauts in 1963. He became the pilot for Gemini 9 upon the death of a prime crew member, was backup pilot for Gemini 12, backup lunar module pilot for Apollo 7, lunar module pilot for Apollo 10, backup commander for Apollo 14, and commander for Apollo 17 (eleventh man to walk on Moon). Captain Cernan was Deputy Director of the Apollo-Soyuz Test Project, and will resign from NASA on July 1, 1976.



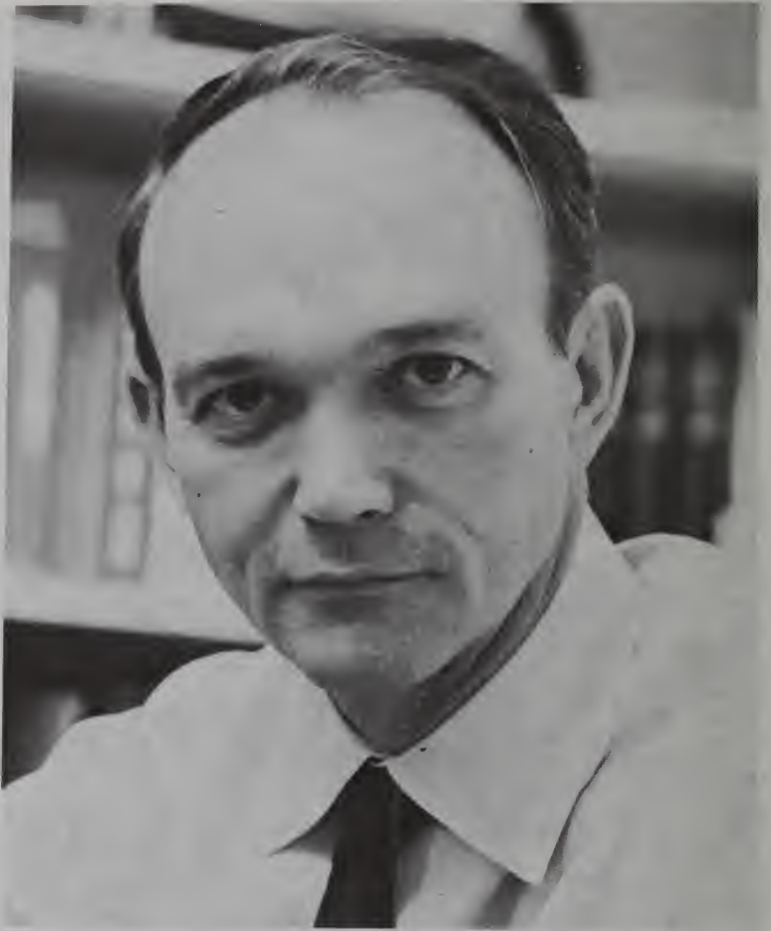
Roger Bruce Chaffee; Lieutenant Commander, USN; born February 15, 1935, Grand Rapids, Michigan; died January 27, 1967 in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1957), and was chosen in the third group of astronauts in 1963. He had been selected as lunar module pilot for the first manned Apollo flight.



Phillip Kenyon Chapman; civilian; born March 5, 1935, Melbourne, Australia; became U.S. citizen May 8, 1967; married, two children.

Received bachelor of science degree in physics and mathematics from Sydney University (1956), served in the Royal Australian Air Force Reserve, received master of science in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), doctorate in instrumentation from MIT (1967), and was chosen in the sixth group of astronauts in 1967. Dr. Chapman resigned from NASA in September 1972 and took a position with AVCO Everett Research Laboratories in Everett, Massachusetts and is also a senior research associate at the MIT Measurement Systems Laboratory in Cambridge, Massachusetts.



Michael Collins; Major General, USAFR; born October 31, 1930, Rome, Italy; married, three children.

Received bachelor of science from the U.S. Military Academy (1952) and was chosen in the third group of astronauts in 1963. Colonel Collins was backup pilot for Gemini 7, pilot for Gemini 10, assigned to Apollo 8 but removed to undergo surgery, and command module pilot for Apollo 11. In November 1969 he resigned from NASA and the Air Force and was appointed Assistant Secretary of State for Public Affairs. In April 1971 he became Director of the National Air and Space Museum at the Smithsonian Institution. His book, *Carrying the Fire* describes his selection into the astronaut program and his experiences on Gemini 10 and Apollo 11.



Charles "Pete" Conrad, Jr.; Captain, USN (Retired); born June 2, 1930, Philadelphia, Pennsylvania; married, four children.

Received bachelor of science in aeronautical engineering from Princeton University in 1953 and was chosen with the second group of astronauts in 1962. Captain Conrad was pilot of Gemini 5, backup command pilot of Gemini 8, commander pilot for Gemini 11, backup commander for Apollo 9, command for Apollo 12 (third man to walk on the Moon), and commander of Skylab 2. He resigned from both NASA and the Navy on February 1, 1974 to become Vice President and Chief Operating Officer of the American Television and Communications Corporation, a cable T.V. firm in Denver, Colorado. He has since taken a position as a vice president of McDonnell-Douglas Corporation.



Leroy Gordon Cooper, Jr.; Colonel, USAF (Retired); born March 6, 1927, Shawnee, Oklahoma; divorced, two children, subsequently remarried.

Received bachelor of science degree in aeronautical engineering from the Air Force Institute of Technology (1956) and was chosen in the first group of astronauts in 1959. Colonel Cooper was backup pilot for Mercury-Atlas 8, pilot for Mercury-Atlas 9 (Faith 7), command pilot for Gemini 5, backup command pilot for Gemini 12, and backup commander for Apollo 10. He retired from NASA and the Air Force in July 1970 to form Gordon Cooper Associates in Hialeah, Florida. He is currently Vice President for Research and Development for Walt Disney Productions.



Robert Laurel Crippen; Commander, USN; born September 11, 1937, Beaumont, Texas; married, three children.

Received bachelor of science degree in aerospace engineering from the University of Texas (1960), and transferred into the NASA astronaut corps from the MOL program in 1969. He was commander of the Skylab Medical Experiments Altitude Test and was part of the support crew for the Apollo-Soyuz Test Project. He is currently assigned to space shuttle development.



Ronnie Walter Cunningham; civilian; born March 16, 1932, Creston, Iowa; married, two children.

Flew as an aviator in the U.S. Marine Corps, received bachelor of arts degree (1960) and master of arts (1961) in physics from the University of California at Los Angeles and was chosen with the third group of astronauts in 1963. He was lunar module pilot on Apollo 7. Mr. Cunningham resigned from NASA in August 1971 and is currently President of the Hydro-Tech Development Company, Houston, Texas.



Charles Moss Duke, Jr.; Colonel, USAF; born October 3, 1935, Charlotte, North Carolina; married, two children.

Received bachelor of science from the U.S. Naval Academy (1957), master of science in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot on Apollo 13, lunar module pilot for Apollo 16 (tenth man to walk on the Moon), and backup lunar module pilot for Apollo 17. He resigned from NASA Jan. 1, 1976 to become a distributor for Coors Beer in San Antonio, Texas.



Donn Fulton Eisele; Colonel, USAF (Retired); born June 23, 1930, Columbus, Ohio; divorced, four children, subsequently remarried.

Received bachelor of science degree from the U.S. Naval Academy (1952), master of science in astronautics from the Air Force Institute of Technology (1960), and was chosen with the third group of astronauts in 1963. He was command module pilot of Apollo 7 and backup command module pilot for Apollo 10. Colonel Eisele left the astronaut corps in June 1970 to become Technical Assistant (Manned Flight), NASA Langley Research Center in Hampton, Virginia. He retired from NASA and the Air Force in July 1972 to become Peace Corps Director in Thailand. He has since resigned and now lives in Williamsburg, Virginia.



Anthony Wayne England; civilian; born May 15, 1942, Indianapolis, Indiana; married, two children.

Received bachelor and master of science degrees in geology and physics from the Massachusetts Institute of Technology (1965), doctorate in earth and planetary sciences from MIT (1970), and was chosen with the sixth group of astronauts in 1967. Dr. England was the mission scientist for Apollo 16. He resigned from NASA in August 1972 and accepted a position with the U.S. Geological Survey, based in Denver, Colorado.



Joe Henry Engle; Colonel, USAF; born August 26, 1932, Abilene, Kansas; married, two children.

Received bachelor of science degree in aeronautical engineering from the University of Kansas (1955), and was chosen in the fifth group of astronauts in 1966. Prior to his selection, Colonel Engle had qualified for the astronaut title in the X-15 program. He was backup lunar module pilot for Apollo 14 and is now assigned to space shuttle development. He has been chosen as one of the pilots for the shuttle approach and landing tests.



Ronald Ellwin Evans; Captain, USN (Retired); born November 10, 1933, St. Francis, Kansas; married, two children.

Received bachelor of science in electrical engineering from the University of Kansas (1956), master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1964), and was chosen with the fifth group of astronauts in 1966. Captain Evans was backup command module pilot for Apollo 14, command module pilot for Apollo 17, and was backup command module pilot for the Apollo-Soyuz Test Project. He retired from the Navy on April 30, 1976 and is currently assigned to space shuttle development.



Theodore Cordy Freeman; Captain, USAF; born February 18, 1930, Haverford, Pennsylvania; died October 31, 1964 in a T-38 jet crash at Ellington Air Force Base, Texas; was married, one child.

Received bachelor of science from the U.S. Naval Academy (1953), master of science in aeronautical engineering from the University of Michigan (1960), and was chosen with the third group of astronauts in 1963.



Charles Gordon Fullerton; Lieutenant Colonel, USAF; born October 11, 1936, Rochester, New York; married, one child.

Received bachelor of science (1957) and master of science (1958) in mechanical engineering from the California Institute of Technology, and transferred into the NASA astronaut corps from the MOL program in 1969. He is currently assigned to space shuttle development and has been chosen as one of the pilots for the shuttle approach and landing tests.



Owen Kay Garriott; civilian; born November 22, 1930, Enid, Oklahoma; married, four children.

Received bachelor of science in electrical engineering from the University of Oklahoma (1953), master of science in electrical engineering from Stanford University (1957), doctorate in electrical engineering from Stanford (1960), and was chosen in the fourth group of astronauts in 1965. He was science pilot for Skylab 3 and is currently on sabbatical at Stanford University. He is scheduled to return to NASA in the fall of 1976.



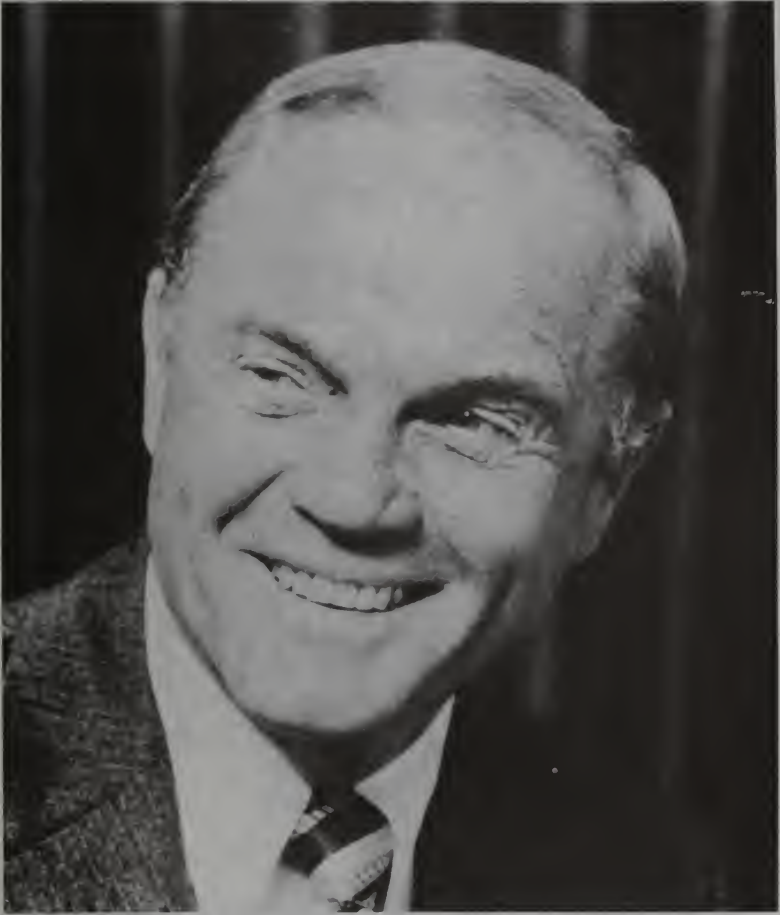
Edward George Gibson; civilian; born November 8, 1936, Buffalo, New York; married, four children.

Received bachelor of science in engineering from the University of Rochester (1959), master of science in engineering from the California Institute of Technology (1964), doctorate in engineering from the California Institute of Technology (1964), and was chosen with the fourth group of astronauts in 1965. He was science pilot for Skylab 4. Dr. Gibson resigned from NASA in November 1974 to join the Aerospace Corporation as senior staff scientist, specializing in the interpretation of solar data gathered during the Skylab program. He currently serves as a senior consultant for Spacelab operations for VFW Fokker/ERNO in Europe.



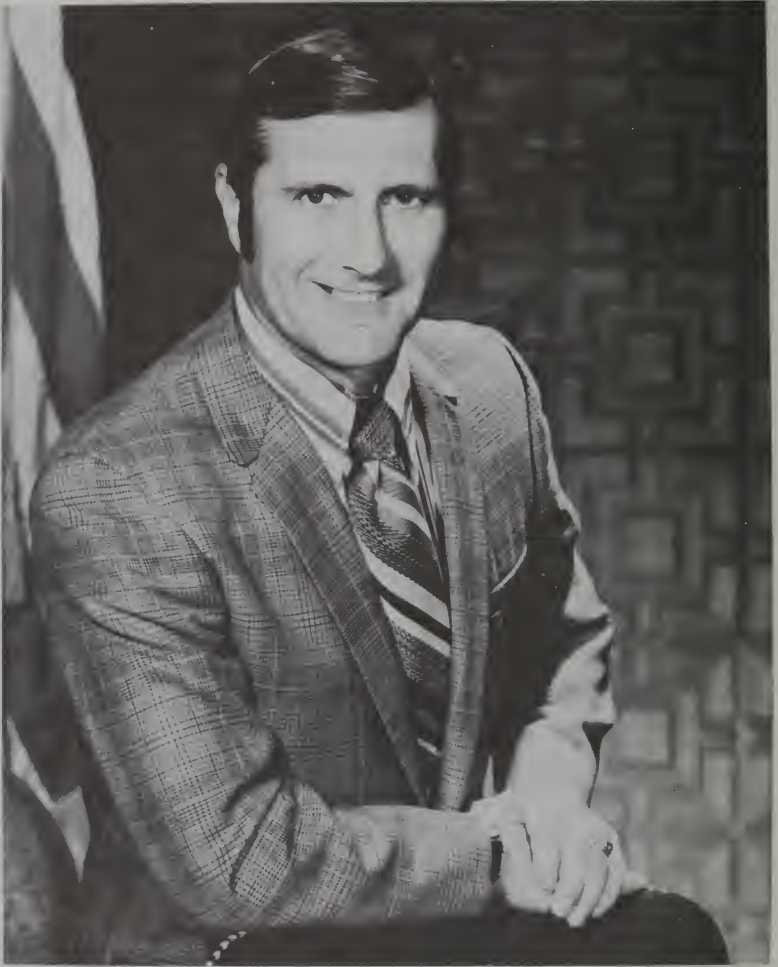
Edward Galen Givens, Jr.; Major, USAF; born January 5, 1930, Quanah, Texas; died June 6, 1967 in an automobile accident near Houston, Texas; was married, two children.

Received bachelor of science from the U.S. Naval Academy (1952) and was chosen with the fifth group of astronauts in 1966.



John Herschel Glenn, Jr.; Colonel, USMC (Retired); born July 18, 1921, Cambridge, Ohio; married, two children.

Attended Muskingum College, entered Naval Aviation Cadet Program (1942), commissioned in the Marine Corps (1943) and was chosen with the first group of astronauts in 1959. He was backup pilot for Mercury-Redstone 3 (Freedom 7) and Mercury-Redstone 4 (Liberty Bell 7), and was the first American to make an orbital flight, in Mercury-Atlas 6 (Friendship 7). He retired from NASA and the Marine Corps in 1964 to join the Royal Crown Cola Co. and to enter politics. He was elected U.S. Senator from the State of Ohio in November 1974.



Richard Francis Gordon, Jr.; Captain, USN (Retired); born October 5, 1929, Seattle, Washington; married, six children.

Received bachelor of science in chemistry from the University of Washington (1951) and was chosen with the third group of astronauts in 1963. Captain Gordon was backup pilot for Gemini 8, pilot for Gemini 11, backup command module pilot for Apollo 9, command pilot for Apollo 12, and backup commander for Apollo 15. He retired from NASA and the Navy on January 1, 1972 and is now Executive Vice President of the New Orleans Saints of the National Football League.



Duane E. Graveline; civilian; born March 2, 1931, Newport, Vermont; married, four children.

Received bachelor of science degree from the University of Vermont, doctor of medicine degree from the University of Vermont Medical School (1955), master of science in public health from Johns Hopkins University (1958), served in the U.S. Air Force, and was chosen with the fourth group of astronauts in 1965. Dr. Graveline resigned from NASA in August 1965 for personal reasons and currently works with the State of Vermont Department of Health in Winooski, Vermont.



Virgil "Gus" Ivan Grissom; Lieutenant Colonel, USAF; born April 3, 1926, Mitchell, Indiana; died January 27, 1967 in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.

Received bachelor of science in mechanical engineering from Purdue University (1950) and was chosen in the first group of astronauts in 1959. He was the pilot for Mercury-Redstone 4 (Liberty Bell 7), command pilot for Gemini 3, backup command pilot for Gemini 6 and had been selected to be commander of the first manned Apollo flight.



Fred Wallace Haise, Jr.; civilian: born November 14, 1933, Biloxi, Mississippi; married, four children.

Received bachelor of science degree in aeronautical engineering from the University of Oklahoma (1959), served as an aviator in both the U.S. Marine Corps and the U.S. Air Force, and was chosen in the fifth group of astronauts in 1966. Mr. Haise was backup lunar module pilot for Apollo 8 and Apollo 11, lunar module pilot for Apollo 13, and backup commander for Apollo 16. He is currently assigned to space shuttle development and has been chosen as one of the pilots for the shuttle approach and landing tests.



Henry Warren Hartsfield, Jr.; Colonel, USAF; born November 21, 1933, Birmingham, Alabama; married, two children.

Received bachelor of science degree in physics from Auburn University (1954), master of science in engineering science from the University of Tennessee (1971), and transferred into the astronaut corps from the MOL program in 1969. He is currently assigned to space shuttle development.



Karl Gordon Henize; civilian; born October 17, 1926, Cincinnati, Ohio; married, four children.

Received bachelor of arts degree in math from the University of Virginia (1947), master of arts in astronomy from the University of Virginia (1948), doctorate in astronomy from the University of Michigan (1954), served in the U.S. Naval Reserve, and was chosen in the sixth group of astronauts in 1967. He was a principal investigator for ultraviolet astronomy experiments for the Skylab program, and is currently assigned to space shuttle development.



Donald Lee Holmquest; civilian; born April 7, 1939, Dallas, Texas, divorced, one child, subsequently remarried.

Received bachelor of science in electrical engineering from Southern Methodist University (1962), doctor of medicine degree from Baylor University College of Medicine (1967), doctorate in physiology from Baylor (1968), and was chosen in the sixth group of astronauts in 1967. Dr. Holmquest took a leave of absence in May 1971 to hold the position of assistant professor of Radiology and Physiology at Baylor College of Medicine. He resigned from NASA in September 1973 and currently is Associate Dean of the Medical School at Texas A&M University.



James Benson Irwin; Colonel, USAF (Retired); born March 17, 1930, Pittsburgh, Pennsylvania; married, four children.

Received bachelor of science from the U.S. Naval Academy (1951), master of science in aeronautical and instrumentation engineering from the University of Michigan (1957) and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot for Apollo 12 and lunar module pilot for Apollo 15 (eighth man to walk on Moon). Colonel Irwin resigned from NASA and the Air Force in July 1972 to form an organization named High Flight located in Colorado Springs, Colorado. He is currently engaged in religious work. His book, *To Rule the Night*, describes his early life, selection into the astronaut program, and his experiences on Apollo 15.



Joseph Peter Kerwin. Captain, USN; born February 19, 1932, Oak Park, Illinois; married, three children.

Received bachelor of arts degree in philosophy from the College of the Holy Cross (1953), doctor of medicine from Northwestern University Medical School (1957), and was chosen with the fourth group of astronauts in 1965. He was the science pilot for Skylab 2, participated in the Outlook for Space study and is currently assigned to space shuttle development. He is also Chief of the Life Sciences Astronaut Office.



William Benjamin Lenoir; civilian; born March 14, 1939, Miami, Florida; married, two children.

Received bachelor of science degree in electrical engineering (1961), master of science in electrical engineering (1962), doctorate in electrical engineering (1965) all from the Massachusetts Institute of Technology, and was chosen with the sixth group of astronauts in 1967. He was backup pilot for Skylab 3 and Skylab 4, and is currently assigned to space shuttle development.



Don Leslie Lind; civilian; born May 18, 1930, Midvale, Utah; married, six children.

Received bachelor of science in physics from the University of Utah (1953), served as an aviator in the U.S. Naval Reserve, received doctorate in high energy physics from the University of California at Berkeley (1964), and was chosen with the fifth group of astronauts in 1966. He was backup science pilot for Skylab 3 and Skylab 4 and is currently on sabbatical leave at the University of Alaska. He is expected to return to NASA in the fall of 1976.



John Anthony Llewellyn; civilian; born April 22, 1933, Cardiff, Wales; became U.S. citizen February 17, 1966; married, three children.

Received bachelor of science (1955) and doctorate (1958) in chemistry from University College, Cardiff, Wales, and was chosen with the sixth group of astronauts in 1967. He withdrew from the program on September 6, 1968 for personal reasons and presently is a professor in the Department of Energy Conversion and Mechanical Design, College of Engineering, University of South Florida.



Jack Robert Lousma; Lieutenant Colonel, USMC; born February 29, 1936, Grand Rapids, Michigan; married, three children.

Received bachelor of science in aeronautical engineering from the University of Michigan (1959), degree of aeronautical engineer from the U.S. Naval Postgraduate School (1965), and was chosen with the fifth group of astronauts in 1966. He was pilot for Skylab 3 and backup docking module pilot for the Apollo-Soyuz Test Project. He is currently assigned to space shuttle development.



James Arthur Lovell, Jr.; Captain, USN (Retired); born March 25, 1928, Cleveland, Ohio; married, four children.

Received bachelor of science from the U.S. Naval Academy (1952) and was chosen with the second group of astronauts in 1962. He was backup pilot for Gemini 4, pilot for Gemini 7, backup command pilot for Gemini 9, command pilot for Gemini 12, command module pilot for Apollo 8, backup commander for Apollo 11, and commander for Apollo 13. In May 1971 he became Deputy Director of Science and Applications at the Johnson Space Center. Captain Lovell retired from NASA and the Navy in March 1973 and is now President and Chief Executive Officer of the Bay-Houston Towing Company, Houston, Texas.



Thomas Kenneth Mattingly II; Commander, USN; born March 17, 1936, Chicago, Illinois; married, one child.

Received bachelor of science in aeronautical engineering from Auburn University (1958) and was chosen in the fifth group of astronauts in 1966. He was scheduled to be command module pilot on Apollo 13 but was replaced by his back-up 72 hours before launch when it was discovered he had been exposed to measles, and was command module pilot for Apollo 16. He is currently assigned to space shuttle development.



Bruce McCandless II; Commander, USN; born June 8, 1937, Boston, Massachusetts: married, two children.

Received bachelor of science from the U.S. Naval Academy (1958), master of science in electrical engineering from Stanford University (1965) and was chosen with the fifth group of astronauts in 1966. He was backup pilot for Skylab 2 and is currently assigned to space shuttle development.



James Alton McDivitt; Brigadier General, USAF (Retired); born June 10, 1929, Chicago, Illinois; married, four children.

Received bachelor of science in aeronautical engineering from the University of Michigan (1959) and was chosen in the second group of astronauts in 1962. He was command pilot of Gemini 4 and commander for Apollo 9. General McDivitt managed the Apollo Spacecraft Program at Johnson Space Center from September 1969 to August 1972. He then resigned from NASA and the Air Force and now is Vice President, Pullman, Inc. of Chicago, Illinois.



Frank Curtis Michel; civilian; born June 5, 1934, La Crosse, Wisconsin; married, two children.

Received bachelor of science degree in physics (1955), doctorate in physics (1962) from the California Institute of Technology, served as an aviator in the U.S. Air Force Reserve, and was chosen with the fourth group of astronauts in 1965. Dr. Michel resigned from the astronaut corps in August 1969 to become a professor of physics at Rice University. He is currently chairman of the Space Physics and Astronomy Program there.



Edgar Dean Mitchell; Captain, USN (Retired); born September 17, 1930, Hereford, Texas; divorced, two children, subsequently remarried.

Received bachelor of science in industrial management from Carnegie Institute of Technology (1952), bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1961), doctorate in aeronautics and astronautics from Massachusetts Institute of Technology (1964), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot for Apollo 10, lunar module pilot for Apollo 14 (sixth man to walk on the Moon), and backup lunar module pilot for Apollo 16. Captain Mitchell retired from the Navy and NASA in October 1972 and founded the Institute of Noetic Sciences, Palo Alto, California, of which he is currently chairman, and is also President of Edgar D. Mitchell and Associates in Atherton, California. He has written a book entitled *Psychic Exploration: A Challenge for Science*.



Franklin Story Musgrave; civilian; born August 19, 1935, Boston, Massachusetts; married, five children.

Received bachelor of science degree in math and statistics from Syracuse University (1958), master of business administration in operations analysis and computer programming from the University of California at Los Angeles (1959), bachelor of arts in chemistry from Marietta College (1960), doctor of medicine from Columbia University (1964), master of science in biophysics from the University of Kentucky (1966), is working toward a doctorate in physiology from the University of Kentucky, has served in both the U.S. Marine Corps and the U.S. Navy, and was chosen with the sixth group of astronauts in 1967. He was the backup science pilot for Skylab 2 and is currently assigned to space shuttle development.



Brian Todd O'Leary; civilian; born January 27, 1940, Boston, Massachusetts; married, two children.

Received bachelor of arts degree in physics from Williams College (1961), master of arts in astronomy from Georgetown University (1964), doctorate in astronomy from University of California at Berkeley (1967), and was chosen with the sixth group of astronauts in 1967. He resigned from NASA in 1968 for personal reasons and took a position on the Cornell University staff. He was an assistant professor of astronomy and science policy assessment at Hampshire College, Amherst, Massachusetts, became a special consultant on nuclear energy matters for the Committee on the Interior, U.S. House of Representatives, and is currently working on plans for space colonization with Gerard O'Neill at Princeton. He has written an autobiographical work, *The Making of an Ex-Astronaut*.



Robert Franklyn Overmyer; Lieutenant Colonel, USMC; born July 14, 1936, Lorain, Ohio; married, three children.

Received bachelor of science degree in physics from Baldwin-Wallace College (1958), master of science in aeronautics at the U.S. Naval Postgraduate School (1964), and transferred into the astronaut corps from the MOL program in 1969. He was part of the support crew for the Apollo-Soyuz Test Project, and is currently assigned to space shuttle development.



Robert Allan Ridley Parker; civilian; born December 14, 1936, New York, New York; married, two children.

Received bachelor of arts degree in astronomy and physics from Amherst College (1958), doctorate in astronomy from the California Institute of Technology (1962), and was chosen with the sixth group of astronauts in 1967. He was mission scientist for Apollo 17 and chief scientist for the Skylab missions. Dr. Parker is currently assigned to space shuttle development and is Chief of the Science and Applications Astronaut Office.



Donald Herod Peterson; Colonel, USAF; born October 22, 1933, Winona, Mississippi; married, three children.

Received bachelor of science from the U.S. Military Academy (1955), master of science in nuclear engineering from the Air Force Institute of Technology (1962) and transferred into the astronaut corps from the MOL program in 1969. He is currently assigned to space shuttle development.



William Reid Pogue; Colonel, USAF (Retired); born January 23, 1930, Okemah, Oklahoma; married, three children.

Received bachelor of science degree in education from Oklahoma Baptist University (1951), master of science in math from Oklahoma State University (1960), and was chosen with the fifth group of astronauts in 1966. He was pilot of Skylab 4. Colonel Pogue resigned from NASA Sept. 1, 1975 to become a Vice President of High Flight, Colorado Springs, Colorado. He returned to NASA April 18, 1976 as an astronaut assigned to the Earth Resources Program Office.



Stuart Allen Roosa; Colonel, USAF; born August 16, 1933, Durango, Colorado; married, four children.

Received bachelor of science in aeronautical engineering from the University of Colorado (1960) and was chosen with the fifth group of astronauts in 1966. He was the command module pilot for Apollo 14, and backup command module pilot for Apollo 16 and Apollo 17. Colonel Roosa resigned from NASA on February 1, 1976.



Walter Marty Schirra, Jr.; Captain, USN (Retired); born March 12, 1923, Hackensack, New Jersey; married, two children.

Received bachelor of science from the U.S. Naval Academy (1945) and was chosen in the first group of astronauts in 1959. He was backup pilot for Mercury-Atlas 7 (Aurora 7), pilot of Mercury-Atlas 8 (Sigma 7), backup command pilot of Gemini 3, command pilot of Gemini 6, and commander of Apollo 7. Captain Schirra retired from the Navy and NASA in July 1969 and became Chairman and Chief Executive Officer of the Environmental Control Company, Englewood, Colorado, and Chairman, Sernco, Inc. He is presently Director of Technology Purchases at Johns-Manville Corp., Denver, Colorado.



Harrison "Jack" Hagan Schmitt; civilian; born July 3, 1935, Santa Rita, New Mexico; single.

Received bachelor of science degree in science from the California Institute of Technology (1957), doctorate in geology at Harvard University (1964) and was chosen with the fourth group of astronauts in 1965. He was backup lunar module pilot for Apollo 15, and lunar module pilot for Apollo 17 (twelfth man to walk on the Moon). He was chief of the scientist-astronauts at the Johnson Space Center before being named NASA's Assistant Administrator for Energy Programs in May 1974, a position he resigned August 30, 1975 to enter politics.



Russell Louis Schweickart; civilian; born October 25, 1935, Neptune, New Jersey; married, five children.

Received bachelor of science in aeronautical engineering (1956) and master of science in aeronautics and astronautics (1963) from the Massachusetts Institute of Technology, served in the U.S. Air Force as an aviator, and was chosen with the third group of astronauts in 1963. He was lunar module pilot on Apollo 9 and backup commander for Skylab 2. Mr. Schweickart is presently NASA's Director of User Affairs in the Office of Applications.



David Randolph Scott; Colonel, USAF (Retired); born June 6, 1932, San Antonio, Texas; married, two children.

Received bachelor of science degree from the U.S. Military Academy (1954), master of science in aeronautics and astronautics and an engineer of aeronautics and astronautics degree from the Massachusetts Institute of Technology, and was chosen with the third group of astronauts in 1963. He was pilot of Gemini 8, command module pilot of Apollo 9, backup commander of Apollo 12, and commander of Apollo 15 (seventh man to walk on the Moon). In July 1972, Colonel Scott became Special Assistant for Mission Operations for the Apollo-Souyuz Test Project and in April 1975 was appointed Director, NASA Flight Research Center, Edwards, California.



Elliot McKay See, Jr.; civilian; born July 23, 1927, Dallas, Texas; died February 28, 1966 in the crash of a T-38 jet near St. Louis, Missouri; was married, three children.

Received bachelor of science degree from the U.S. Merchant Marine Academy (1949), served as an aviator in the U.S. Navy, received master of science in engineering from the University of California at Los Angeles (1962), and was chosen in the second group of astronauts in 1962. He was backup pilot for Gemini 5 and was slated to be command pilot for Gemini 9 at the time of his death.



Alan Bartlett Shepard, Jr.; Rear Admiral, USN (Retired); born November 18, 1923, East Derry, New Hampshire; married, two children.

Received bachelor of science degree from the U.S. Naval Academy (1944) and was chosen with the first group of astronauts in 1959. He was pilot of Mercury-Redstone 3 (Freedom 7) becoming America's first man in space, backup pilot for Mercury-Atlas 9, was subsequently grounded due to an inner ear ailment until May 7, 1969 (during which time he served as chief of the Astronaut Office), commander of Apollo 14 (fifth man to walk on the Moon), and in June 1971 resumed duties as chief of the Astronaut Office. He retired from NASA and the Navy in July 1974 to join the Marathon Construction Company of Houston as partner and chairman.



Donald "Deke" Kent Slayton; Major, USAF (Retired); born March 1, 1924, Sparta, Wisconsin; married, one child.

Received bachelor of science in aeronautical engineering from the University of Minnesota (1949) and was chosen with the first group of astronauts in 1959. He was chosen as command pilot for Mercury-Atlas 7 but was removed due to detection of a heart murmur. He resigned his commission as an Air Force Major in November 1963 but continued as an active member of the astronaut team, becoming Director of Flight Crew Operations, a position he held until February 1974. Mr. Slayton returned to flight status in March 1972 and was docking module pilot for the Apollo-Soyuz Test Project. He is currently Deputy Director of Flight Operations for Shuttle Approach and Landing Tests.



Thomas Patten Stafford; Major General, USAF; born September 17, 1930, Weatherford, Oklahoma; married, two children.

Received bachelor of science degree from the U.S. Naval Academy (1952) and was chosen with the second group of astronauts in 1962. He was backup pilot for Gemini 3, pilot for Gemini 6, became command pilot for Gemini 9 upon the death of a prime crew member, backup commander for Apollo 7, commander for Apollo 10, and commander of the Apollo-Soyuz Test Project. General Stafford was chief of the Astronaut Office from August 1969 to May 1971 and was subsequently named Deputy Director for Flight Crew Operations. He resigned from NASA on November 1, 1975 to become commander of the USAF Flight Test Center, Edwards Air Force Base, California.



John Leonard Swigert, Jr.; civilian; born August 30, 1931, Denver, Colorado; single.

Received bachelor of science degree in mechanical engineering from the University of Colorado (1953), served as an aviator in the U.S. Air Force, received master of science in aerospace science from Rensselaer Polytechnic Institute (1965), master of science in business administration from the University of Hartford (1967), and was chosen with the fifth group of astronauts in 1966. He was scheduled to be backup command module pilot for Apollo 13 but became command module pilot 72 hours prior to launch when a prime crew member was exposed to German measles. Mr. Swigert took a leave of absence from NASA in April 1973 to become Executive Director of the Committee on Science and Technology, U.S. House of Representatives.



William Edgar Thornton; civilian; born April 14, 1929, Faison, North Carolina; married, two children.

Received bachelor of science degree in physics (1952) and doctor of medicine (1963) from the University of North Carolina, served in the U.S. Air Force, and was chosen with the sixth group of astronauts in 1967. He was a crew member of the Skylab Medical Experiments Altitude Test and is currently assigned to space shuttle development.



Richard Harrison Truly; Commander, USN; born November 12, 1937, Fayette, Mississippi; married, three children.

Received bachelor of aeronautical engineering degree from the Georgia Institute of Technology (1959) and transferred into the astronaut corps from the MOL program in 1969. He was a member of the astronaut support crew for the Apollo-Soyuz Test Project, and is currently assigned to space shuttle development. He has been chosen as one of the pilots for the shuttle approach and landing tests.



Paul Joseph Weitz; Captain, USN; born July 25, 1932, Erie, Pennsylvania; married, two children.

Received bachelor of science degree in aeronautical engineering from Pennsylvania State University (1954), master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1964) and was chosen with the fifth group of astronauts in 1966. He was pilot for Skylab 2 and is currently assigned to space shuttle development.



Edward Higgins White, II; Lieutenant Colonel, USAF; born November 14, 1930, San Antonio, Texas; died January 27, 1967 in the Apollo 204 fire at Cape Kennedy, Florida; was married, four children.

Received bachelor of science degree from the U.S. Military Academy (1952), master of science in aeronautical engineering from the University of Michigan (1959), and was chosen with the second group of astronauts in 1962. He was pilot of Gemini 4 (first American to walk in space), backup command pilot for Gemini 7, and had been selected to be command module pilot for the first manned Apollo flight.



Clifton Curtis Williams, Jr.; Major, USMC; born September 26, 1932, Mobile, Alabama; died October 5, 1967 in the crash of a T-38 jet near Tallahassee, Florida; was married, one child.

Received bachelor of science in mechanical engineering from Auburn University and was chosen with the third group of astronauts in 1963. He had been selected as backup pilot for Gemini 10.



Alfred Merrill Worden; Lieutenant Colonel, USAF; born February 7, 1932, Jackson, Michigan; divorced, two children, subsequently remarried.

Received bachelor of science degree from the U.S. Military Academy (1955), master of science degrees in astronautical/aeronautical engineering and instrumentation engineering from the University of Michigan (1963) and was chosen with the fifth group of astronauts in 1966. He was backup command module pilot for Apollo 12 and command module pilot for Apollo 15. In September 1972 Colonel Worden was assigned to NASA Ames Research Center, Mountain View, California as Director of Advanced Research and Technology. He resigned from NASA on September 1, 1975 and is now Vice President of High Flight, Colorado Springs, Colorado. He has written a book of poetry entitled *Hello Earth: Greetings from Endeavor*, and a children's book *A Flight to the Moon*.



John Watts Young; Captain, USN; born September 24, 1930, San Francisco, California; divorced, two children, subsequently remarried.

Received bachelor of science degree in aeronautical engineering from the Georgia Institute of Technology (1952) and was chosen with the second group of astronauts in 1962. He was pilot of Gemini 3, backup pilot for Gemini 6, command pilot for Gemini 10, backup command module pilot for Apollo 7, command module pilot for Apollo 10, backup commander for Apollo 13, commander for Apollo 16 (ninth man to walk on the Moon), and backup commander of Apollo 17. Currently he is chief of the Flight Operations Astronaut Office and assigned to space shuttle development.

TABLE 1-2.—*Summary of NASA Astronauts*

Name	Group/year chosen	Service/rank (retired)	Native State	Flights	Current position
Aldrin	III/1963	USAF/(Col.)	New Jersey	Gemini 12, Apollo 11	Consultant in California.
Allen	VI/1967	Civilian	Indiana		Assistant administrator for legislative affairs, NASA headquarters.
Anders	III/1963	USAFR/(Col.)	Hong Kong	Apollo 8	Ambassador to Norway.
Armstrong	II/1962	Civilian	Ohio	Gemini 8, Apollo 11	Professor of aeronautical engineering, University of Cincinnati.
Bassett	III/1963	USAF/Maj	do		Killed in T-38 crash.
Bean ¹	III/1963	USN/Capt	Texas	Apollo 12, Skylab 3	Assigned to space shuttle development.
Bobko ¹	VII/1969	USAF/Lt. Col	New York		Do.
Borman	II/1962	USAF/(Col.)	Indian	Gemini 7, Apollo 8	President and chief operating officer, Eastern Airlines.
Brand ¹	V/1966	Civilian	Colorado		Assigned to space shuttle development.
Bull	V/1966	USN/Lt. Cdr.)	Tennessee		Working toward Ph.D. at Stanford.
Carpenter	I/1959	USN/(Cdr.)	Colorado	Mercury-Atlas 7	In private business in Los Angeles.
Carr ¹	V/1966	USMC/(Col.)	do	Skylab 4	Assigned to space shuttle development.
Cernan	III/1963	USN/Capt	Illinois	Gemini 9, Apollo 10, Apollo 17.	Resigned July 1976.
Chaffee	III/1963	USN/Lt. Cdr	Michigan		Died in Apollo 204 fire.
Chapman	VI/1967	Civilian	Australia		AVCO Everett Research Labs, Massachusetts.
Collins	III/1963	USAFR/Maj. Gen.	Italy	Gemini 10, Apollo 11	Director, National Air and Space Museum, Smithsonian Institution.
Conrad	II/1962	USN/(Capt.)	Pennsylvania	Gemini 5, Gemini 11, Apollo 12, Skylab 2.	Vice president. McDonnell-Douglas Corporation.
Cooper	I/1959	USAF/(Col.)	Oklahoma	Mercury-Atlas 9, Gemini 5.	Vice president for research and development, Walt Disney Productions.
Crippen ¹	VII/1969	USN/Cdr	Texas		Assigned to space shuttle development.
Cunningham	III/1963	Civilian	Iowa	Apollo 7	President, Hydro-Tech Development Co., Houston.
Duke	V/1966	USAF/Col	North Carolina	Apollo 16	Distributor for Coors Beer, San Antonio, Tex.

Eisele	III/1963	USAF/(Col.)	Ohio	Apollo 7	Resides in Williamsburg, Va.
England	VI/1967	Civilian	Indiana		U.S. Geological Survey in Denver.
Engle ¹	V/1966	USAF/Col.	Kansas		Assigned to shuttle approach and landing tests.
Evans ¹	V/1966	USN/(Capt.)	do	Apollo 17	Assigned to space shuttle development.
Freeman	III/1963	USAF/Capt.	Pennsylvania		Killed in T-38 crash.
Fullerton ¹	VII/1969	USAF/Lt. Col.	New York		Assigned to shuttle approach and landing tests.
Garriott ¹	IV/1965	Civilian	Oklahoma	Skylab 3	On sabbatical at Stanford University.
Gibson	IV/1965	do	New York	Skylab 4	Scheduled to return in the fall of 1976.
Givens	V/1966	USAF/Maj.	Texas		Senior consultant for spacelab operations, VFW Fokker/ERNO.
Glenn	I/1959	USMC/(Col.)	Ohio	Mercury-Atlas 6	Died in automobile accident.
Gordon	III/1963	USN/(Capt.)	Washington	Gemini 11, Apollo 12	U.S. Senator from Ohio.
Graveline	IV/1965	Civilian	Vermont		Executive vice president, New Orleans Saints, NFL.
Grisom	I/1959	USAF/Lt. Col.	Indiana	Mercury-Redstone 4, Gemini 3	State of Vermont Department of Health.
Haise ¹	V/1966	Civilian	Mississippi	Apollo 13	Died in Apollo 204 fire.
Hartsfield ¹	VII/1969	USAF/Col.	Alabama		Assigned to shuttle approach and landing tests.
Henize ¹	VI/1967	Civilian	Ohio		Assigned to space shuttle development.
Holmquest	VI/1967	do	Texas		Do.
Irwin	V/1966	USAF/(Col.)	Pennsylvania	Apollo 15	Associate dean of Texas A. & M. Medical School.
Kerwin ¹	IV/1965	USN/Capt.	Illinois	Skylab 2	High Flight, Colorado Springs, Colo.
Lenoir ¹	VI/1967	Civilian	Florida		Chief, Life Sciences Astronaut Office and assigned to space shuttle development.
Lind ¹	V/1966	do	Utah		Assigned to space shuttle development.
Llewellyn	VI/1967	do	Wales		Sabbatical leave at University of Alaska until fall 1976.
					Professor, Department of Energy Conversion and Mechanical Design, University of South Florida.

See footnote at end of table.

TABLE 1-2.—*Summary of NASA Astronauts—Continued*

Name	Group/year chosen	Service/rank (retired)	Native State	Flights	Current position
Lousma ¹	V/1966	USMC/Lt. Col.	Michigan	Skylab 3	Assigned to space shuttle development.
Lovell	II/1962	USN/(Capt.)	Ohio	Gemini 7, Gemini 12, Apollo 8, Apollo 13	President and chief executive officer of Bay-Houston Towing Co.
Mattingly ¹	V/1966	USN/Cdr.	Illinois	Apollo 16	Assigned to space shuttle development.
McCandless ¹	V/1966	USN/Cdr.	Massachusetts		Do.
McDivitt	II/1962	USAF/(Brig. Gen.)	Illinois	Gemini 4, Apollo 9	Vice president, Pullman, Inc., Chicago, Ill.
Michel	IV/1965	Civilian	Wisconsin		Chairman, space physics and astronomy program, Rice University.
Mitchell	V/1966	USN/(Capt.)	Texas	Apollo 14	Chairman, Institute of Noetic Sciences.
Musgrave ¹	VI/1967	Civilian	Massachusetts		Assigned to space shuttle development.
O'Leary	VI/1967	do	do		Working on plans for space colonization at Princeton.
Overmyer ¹	VII/1969	USMC/Lt. Col.	Ohio		Assigned to space shuttle development.
Parker ¹	VI/1967	Civilian	New York		Assigned to space shuttle development, and Chief, Science and Applications Astronaut Office.
Peterson ¹	VII/1969	USAF/Col.	Mississippi		Assigned to space shuttle development.
Pogue ¹	V/1966	USAF/(Col.)	Oklahoma	Skylab 4	Assigned to earth resources program office.
Roosa	V/1966	USAF/Col.	Colorado	Apollo 14	Resigned from NASA, Feb. 1, 1976.

Schirra.....	I/1959	USN/(Capt.)	New Jersey	Mercury-Atlas 8, Gemini 6, Apollo 7.	Director of technology purchases, Johns- Mansville Corp., Denver.
Schmitt.....	IV/1965	Civilian	New Mexico	Apollo 17	Entered politics.
Schweickart.....	III/1963	do	New Jersey	Apollo 9	Director of User Affairs, NASA.
Scott.....	III/1963	USAF/(Col.)	Texas	Gemini 8, Apollo 9, Apollo 15.	Director, NASA Flight Research Center, Edwards, Calif.
See.....	II/1962	Civilian	do		Killed in T-38 crash.
Shepard.....	I/1959	USN/(Rear Adm.)	New Hampshire	Mercury-Redstone 3, Apollo 14.	Chairman, Marathon Construction Co., Houston, Tex.
Slayton ¹	I/1959	USAF/(Maj.)	Wisconsin		Deputy director of flight operations for shuttle approach and landing tests.
Stafford.....	II/1962	USAF/Maj.	Oklahoma	Gemini 6, Gemini 9, Apollo 10.	Commander, USAF Flight Test Center, Edwards AFB.
Swigert.....	V/1966	Gen.	Colorado	Apollo 13.	Executive Director, House Committee on Science and Technology.
Thornton ¹	VI/1967	do	North Carolina		Assigned to space shuttle development.
Truly ¹	VII/1969	USN/Cdr	Mississippi		Assigned to shuttle approach and landing tests.
Weitz ¹	V/1966	USN/Capt.	Pennsylvania	Skylab 2.	Assigned to space shuttle development.
White.....	II/1962	USAF/Lt. Col.	Texas	Gemini 4	Died in Apollo 204 fire.
Williams.....	III/1963	USMC/Maj.	Alabama		Killed in T-38 crash.
Worden.....	V/1966	USAF/Lt. Col.	Michigan	Apollo 15.	Vice president, High Flight, Colorado Springs, Colo.
Young ¹	II/1962	USN/Capt.	California	Gemini 3, Gemini 10, Apollo 10, Apollo 16.	Chief of the Astronaut Office and assigned to space shuttle development.

¹ Indicates still on active duty as astronaut.

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CHAPTER TWO

THE X-15, X-20 DYNA-SOAR AND MANNED ORBITING LABORATORY PROGRAMS

X-15

The X-15 was a sophisticated research aircraft that would fly at hypersonic speeds (over 4500 miles per hour) as well as attain high altitudes (over 350,000 feet). The X-15 program was a joint NASA-Navy-Air Force project which had its origins in the summer of 1952. At the time, the National Advisory Council on Aeronautics (NACA) directed its laboratories to study concepts for a very high altitude supersonic manned flight, the problems associated with it, and methods for fully exploring the problem areas.

The flight research program for the X-15 consisted of a series of progressive steps to higher speeds and higher altitudes to obtain new data or confirm theoretical or wind tunnel data on characteristics of an airplane performing in a very advanced flight regime. The first X-15 was completed and moved to Edwards Air Force Base in October 1958. On June 8, 1959, pilot Scott Crossfield made the first powerless glide flight in the plane. Three months later, Crossfield completed the first powered flight. By the summer of 1963, all the major research objectives of the X-15 had been achieved. There remained continuing detailed research work which the X-15 conducted until the program was cancelled in December 1968.

X-20 DYNA-SOAR

The Dyna-Soar was a joint Air Force-NASA project financed and administered by the Department of Defense. The program aimed at development of a small, piloted glider which could be boosted into space flight and which would be capable of maneuverable reentry from orbit to a conventional controlled landing. Primarily a manned military space research vehicle, the Dyna-Soar was to achieve orbital velocity and thereby be able to explore the problems and conditions of hypersonic flight beyond the range of the X-15 research aircraft.

The project was initiated in 1961 and six pilots were chosen on September 20, 1962, but when the Manned Orbiting Laboratory (MOL) program began in 1963, the Air Force and NASA decided to terminate the X-20. It had limited utility as an in-space test facility and the Defense Department believed that exploration of the hypersonic flight regime and development of maneuverable reentry and recovery techniques could be more economically conducted in a program of unmanned lifting reentry vehicles.

MANNED ORBITING LABORATORY (MOL)

The Department of Defense Manned Orbiting Laboratory program originated in 1963. The program was first conceived as a means to determine the military usefulness of man in space. After the initiation of the MOL program, study by the Air Force and the Navy resulted in broader program goals and a wider definition of areas of principal interest. MOL was to: a) learn more about what man is able to do in space and how that ability could be used for defense purposes; b) develop the technology and equipment which would help advance manned and unmanned space flight; and c) experiment with this technology and equipment.

The Manned Orbiting Laboratory was to be equipped to accommodate two men in orbit for thirty days. The Department of Defense selected a total of seventeen astronauts for the program. All of these men were military test pilots and graduates of the Aerospace Research Pilot School at Edwards Air Force Base, California. The astronaut candidates were selected in three groups: Group 1, November 12, 1965, 8 chosen; Group 2, June 17, 1966, 5 chosen; Group 3, June 30, 1967, 4 chosen.

The Department of Defense cancelled the MOL program on June 10, 1969. Among the contributing factors were 1) the immediate need to significantly reduce the DOD budget and 2) the continuing large annual investments which would have been necessary to sustain program progress. DOD tried to assure useful application of a significant portion of the investment in the MOL by transferring MOL technology and hardware to laboratories, NASA, and designated Government agencies.



James A. Abrahamson, MOL; Brigadier General, USAF; born May 19, 1933, Inglewood, California; married, two children.

Received bachelor of science degree in aeronautical engineering from the Massachusetts Institute of Technology, master of science in aerospace engineering from the University of Oklahoma, and was chosen for the MOL Program in 1967 (Group III). After the MOL was cancelled, he became a staff member of the National Aeronautics and Space Council. When the Council was dissolved in 1973, he returned to active duty with the Air Force and is currently Inspector General, Air Force Systems Command, Andrews AFB, Maryland.



Michael James Adams, MOL, X-15; Major, USAF; born May 5, 1930, Sacramento, California; died November 15, 1967 near Edwards Air Force Base, California in an X-15 crash; was married, three children.

Received bachelor of science degree in aeronautical engineering from Oklahoma University (1958) and was chosen for the MOL program in 1965 (Group I). The next year he transferred to the X-15.



Neil Alden Armstrong, X-15, NASA. Biography under NASA astronauts.



Karol Joseph Bobko, MOL, NASA. Biography under NASA astronauts.



Albert H. Crews, Jr., X-20 Dyna-Soar, MOL; Colonel, USAF; born March 23, 1929; El Dorado, Arkansas; married, three children.

Received bachelor of science degree in chemical engineering from the University of Southern Louisiana (1950), master of science in aeronautical engineering from the Air Force Institute of Technology, and was named to pilot the X-20 Dyna-Soar in 1962. He was chosen for the MOL program in 1965 (Group I), and after its cancellation transferred to the NASA Flight Crew Operations Directorate at the Johnson Space Center.



Robert Laurel Crippen, MOL, NASA. Biography under NASA astronauts.



Albert Scott Crossfield, X-15; civilian; born October 2, 1921, Berkeley, California; married, six children.

Received bachelor of science degree (1949) and master of science (1950) in aeronautical engineering from the University of Washington. He was an X-15 pilot from 1959 to 1960 and made the first glide flight as well as the first powered flight. After the X-15 was turned over to NASA and the Air Force in 1960, he continued at North American Aviation as director of test and quality assurance. Mr. Crossfield has also directed research and development programs for Eastern Airlines, and currently resides near Washington, D.C.



William Harvey Dana, X-15; civilian; born November 3, 1930, Pasadena, California; married, three children.

Received bachelor of science degree from the U.S. Military Academy (1952), master of science in aeronautical engineering from the University of Southern California (1958), was an Air Force pilot, and flew the X-15 from 1965-1968. He piloted the aircraft to an altitude of 310,000 feet, thus qualifying for the astronaut title. He is now at NASA's Dryden Flight Research Center, Edwards, California.



Joe Henry Engle, X-15, NASA. Biography under NASA astronauts.



John Lawrence Finley, MOL; Captain, U.S. Navy, born December 22, 1935, Winchester, Massachusetts; married, two children.

Received bachelor of science degree from the U.S. Naval Academy (1957) and was chosen for the MOL program in 1965 (Group I). After cancellation of the program, Commander Finley returned to operational flying duty with the Navy. He is currently Commander of an attack carrier, Air Wing 5, FPO San Francisco.



Charles Gordon Fullerton, MOL, NASA. Biography under NASA astronauts.



Henry C. Gordon, X-20 Dyna-Soar; Colonel, USAF (Retired); born December 23, 1925, Valparaiso, Indiana; married, four children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1950) and was chosen to pilot the X-20 Dyna-Soar while assigned to the Air Force Flight Test Center at Edwards, California. When the program was cancelled, he remained on active duty with the Air Force and is now retired.



Henry Warren Hartsfield, Jr., MOL, NASA. Biography under NASA astronauts.



Robert Tralles Herres, MOL; Brigadier General, USAF; born December 1, 1932, Denver, Colorado; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1953), master of science in electrical engineering from the Air Force Institute of Technology, master of science in public administration from George Washington University, and was chosen for the MOL program in 1967 (Group III). After cancellation of the program he returned to flight duty with the Air Force, and is currently Deputy for Security Assistance Programs, Hanscom Air Force Base, Massachusetts.



William "Pete" J. Knight, X-20 Dyna-Soar, X-15; Colonel, USAF, born November 18, 1929, Nobelsville, Indiana; married, two children.

Received bachelor of science in aeronautical engineering from the Air Force Institute of Technology (1958), and was chosen for the X-20 Dyna-Soar program in 1962. With the cancellation of that program, he remained an experimental test pilot at Edwards Air Force Base, California. Colonel Knight was assigned to the X-15 in 1964 and flew it from 1965 to 1968 qualifying for the astronaut rating. Currently he is stationed with Aerospace Systems Division, Wright-Patterson Air Force Base, Ohio.



Robert Henry Lawrence, Jr., MOL; Major, USAF; born October 2, 1935, Chicago, Illinois; died December 8, 1967, in the crash of an F-104 at Edwards Air Force Base, California; was married, one child.

Received bachelor of science degree in chemistry from Bradley University (1956), doctorate in nuclear chemistry from Ohio State University (1965), and was chosen for the MOL program in 1967 (Group III).



Richard E. Lawyer, MOL; Colonel, USAF; born November 8, 1932, Los Angeles, California; married, three children.

Received bachelor of science degree in aeronautical engineering from the University of California (1955) and was chosen for the MOL program in 1965 (Group I). After MOL was cancelled, he returned to flight duty and is presently with the 4900th Test Group, Kirtland Air Force Base, New Mexico.



Lachlan Macleay, MOL; Colonel, USAF; born June 13, 1931, St. Louis, Missouri; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1954) and was chosen for the MOL program in 1965 (Group I). After cancellation of the program, he returned to flight duty. Currently Col. Macleay is with Aerospace Systems Division, Wright-Patterson Air Force Base, Ohio.



John B. McKay, X-15; civilian; born December 8, 1922, Portsmouth, Virginia; died May 1975 of complications of injuries suffered in a 1962 X-15 crash, Lancaster, California; was married, eight children.

Flew as a Navy pilot in World War II, received bachelor of science degree from Virginia Polytechnic Institute (1950) and became a test pilot and aeronautical research engineer at the NASA Flight Research Center, Edwards, California, specializing in high-speed flight research. He was in the X-15 program from 1960 to 1966 and reached a height of 300,000 feet, thus receiving the astronaut title.



Francis Gregory Neubeck, MOL; Colonel, USAF; born April 11, 1932, Washington, D.C.; married, one child.

Received a bachelor of science degree from the U.S. Naval Academy (1955) and was chosen for the MOL program in 1965 (Group I). When MOL was cancelled he returned to flight duty with the Air Force. He is currently Deputy Commander, Test Evaluation, Air Defense Weapons Center, Tyndall Air Force Base, Florida.



Robert Franklyn Overmyer, MOL, NASA. Biography under NASA astronauts.



Forrest Silas Petersen, X-15; Vice Admiral, USN; born May 16, 1922, Holdrege, Nebraska; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1944), bachelor of science in aerospace engineering from the U.S. Naval Postgraduate School (1952), master of science in engineering from Princeton University (1953), and was in the X-15 program from 1958 to 1962. He made five free flights reaching speeds of Mach 5.32 and reaching altitudes in excess of 100,000 feet. He became Vice Chief of Naval Material and was recently promoted to Deputy Chief of Naval Operations for air warfare.



Donald Herod Peterson, MOL, NASA. Biography under NASA astronauts.



Russell L. Rogers, X-20 Dyna-Soar; Major, USAF; born April 12 1926, Lawrence, Kansas; died September 13, 1967 in an F-105, explosion near Kadena Air Force Base, Okinawa; was married, four children.

Received bachelor of science degree in aeronautical engineering from the University of Colorado (1958) and was an experimental flight test pilot for the Air Force Test Center when chosen to pilot the X-20 Dyna-Soar. After the program's cancellation, he returned to active flight duty with the Air Force.



Robert A. Rushworth, X-15; Major General, USAF; born October 9, 1924, Madison, Maine; married, one child.

Received mechanical engineering degree from the University of Maine (1951), bachelor of science in aeronautical engineering from the Air Force Institute of Technology (1954), and was selected as an X-15 pilot in 1958. He flew the craft from 1960 to 1966, reaching a height of 285,000 feet, thus achieving the astronaut title. General Rushworth was Commander of the Air Force Flight Test Center, Edwards Air Force Base, and is currently Commander, Air Force Test and Evaluation Center, Kirtland Air Force Base, New Mexico.



James M. Taylor, MOL; Lieutenant Colonel, USAF; born November 27, 1930, Stamps, Arkansas; died September 1970 in the crash of a T-38 jet near Palmdale, California; was married, three children.

Received associate arts degree at Southern State University (1950), bachelor of science in electrical engineering at the University of Michigan (1959), and was chosen for the MOL program in 1965 (Group I). He returned to flight duty when MOL was cancelled, and was an instructor at the Test Pilot School, Edwards Air Force Base, California at the time of his death.



Milton O. Thompson, X-20 Dyna-Soar, X-15; civilian; born May 4, 1926, Crookston, Minnesota; married, five children.

Flew as a Navy pilot during World War II, received bachelor of science degree in engineering from the University of Washington (1953) and was the only civilian chosen to fly the X-20. With the program's cancellation, he was assigned to the X-15, and he piloted the craft from 1963 to 1965. He also was the first man to fly a lifting body (a wingless craft which obtains lift from its shape) in August 1963. In the fall of 1966 Mr. Thompson became the Director of Research Projects, NASA Flight Research Center, and is currently Chief Engineer there.



Richard Harrison Truly, MOL, NASA. Biography under NASA astronauts.



Joseph Albert Walker, X-15; civilian; born February 20, 1921, Washington, Pennsylvania; died June 8, 1966 in a mid-air collision between the F-104 he was piloting and an XB-70; was married, four children.

Received bachelor of arts degree in physics from Washington and Jefferson College (1942), became an Air Force pilot during World War II, and flew the X-15 from 1960 to 1963. He made the first X-15 research flight on March 25, 1960. Mr. Walker piloted the X-15 to a height of 354,000 feet, thus achieving the astronaut title.



Robert Michael White, X-15; Major General, USAF; born July 6, 1924, New York, New York; married, four children.

Received a bachelor of science degree in electrical engineering from New York University (1951), master of business administration from George Washington University (1966), and flew the X-15 from 1960 to 1962. He was the first astronaut so designated in a winged aircraft by flying to 59.6 miles in July 1962. He is Currently Chief of Staff, Ramstein Air Base, Germany.



James W. Wood, X-20 Dyna-Soar; Colonel, USAF (Retired; born August 9, 1924, Paragould, Arkansas; married, three children.

Received a bachelor of science degree in aeronautical engineering from the Air Force Institute of Technology (1956) and was an experimental flight test pilot at the Air Force Flight Test Center when he was named to pilot the X-20 Dyna-Soar. He remained on active duty with the Air Force after cancellation of the program. Colonel Wood was the Commander, Test Operations, Edwards Air Force Base, California, and retired recently.

TABLE 2-1.—Summary of X-15, X-20 and MOL Astronauts

Name	Group/Year chosen	Service/Rank (Retired)	Native State	Program	Comments
Abrahamson	III/1967	USAF/Brig. Gen.	California	MOL	Currently Inspector General Air Force Systems Command, Andrews AFB.
Adams	I/1965	USAF/Maj.	do	MOL, X-15	Killed in X-15 crash.
Armstrong		Civilian	Ohio	X-15	Withdrew from X-15 program to become NASA astronaut.
Bobko	II/1966	USAF/Lt. Col.	New York	MOL	Transferred to NASA astronaut group.
Crews	I/1965	USAF/Col.	Arkansas	X-20, MOL	Transferred to NASA Flight Crew Operations Directorate, JSC.
Crippen	II/1966	Navy/Lt. Cdr.	Texas	MOL	Transferred to NASA astronaut group.
Crossfield		Civilian	California	X-15	Currently resides in Washington, D.C. area.
Dana		do	do	X-15	Reached an altitude of 310,000 ft. Currently research pilot at NASA's Flight Research Center.
Engle		USAF/Col.	Kansas	X-15	Reached an altitude of 280,000 ft. Transferred to NASA astronaut group.
Finley	I/1965	Navy/Capt.	Texas	MOL	Currently commander of an attack carrier, Air Wing 5, FPO San Francisco.
Fullerton	II/1966	USAF/Maj.	New York	MOL	Transferred to NASA astronaut group.
Gordon	1961	USAF/(Col.)	Indiana	X-20	Retired.
Hartsfield	II/1966	USAF/Lt. Col.	Alabama	MOL	Transferred to NASA astronaut group.
Herrges	III/1967	USAF/Brig. Gen.	Colorado	MOL	Currently at Hanscom AFB, Mass.

Knight	1961	USAF/Col.	Indiana	X-20, X-15	Currently stationed at Wright-Patterson AFB, Ohio.
Lawrence	III/1967	USAF/Maj	Illinois	MOL	Killed in F-104 crash.
Lawyer	I/1965	USAF/Col.	California	MOL	Currently with 4900th Test Group, Kirtland AFB, N. Mex.
MacLay	I/1965	USAF/Col.	Missouri	MOL	Currently at Wright-Patterson AFB.
McKay		Civilian	Virginia	X-15	Died in May 1975 from injuries in 1962 X-15 crash.
Neubeck	I/1965	USAF/Col.	Washington, D.C.	MOL	Currently stationed in Tyndall AFB, Fla.
Overmyer	II/1966	USMC/Lt. Col.	Ohio	MOL	Transferred to NASA astronaut group.
Petersen		Navy/Vice Adm	Nebraska	X-15	Currently Deputy Chief of Naval Operations for Air Warfare.
Peterson	III/1967	USAF/Lt. Col.	Mississippi	MOL	Transferred to NASA astronaut group.
Rogers	1961	USAF/Maj	Kansas	X-20	Killed in F-105 explosion.
Rushworth		USAF/Maj. Gen.	Maine	X-15	Currently Commander, AF Test and Evaluation Center, Kirtland AFB, N. Mex.
Taylor	I/1965	USAF/Lt. Col.	Arkansas	MOL	Killed in T-38 crash.
Thompson	1961	Civilian	Minnesota	X-20, X-15	Currently Chief Engineer, NASA Flight Research Center.
Truly	I/1965	Navy/Lt. Col.	Mississippi	MOL	Transferred to NASA astronaut group.
Walker		Civilian	Pennsylvania	X-15	Reached an altitude of 354,000 ft. Killed in mid-air collision.
White		USAF/Maj. Gen.	New York	X-15	1st astronaut so designated in a winged aircraft. Reached an altitude of 314,688 ft.
Wood	1961	USAF/(Col.)	Arkansas	X-20	Currently stationed at Ramstein AFB, Germany.
					Retired.

CHAPTER THREE

SOVIET COSMONAUTS

Information on the Soviet cosmonauts is not as readily available as it is on the American astronauts. Ordinarily, Soviet cosmonauts become known only when they make a flight. However, the U.S.S.R. Academy of Sciences announced in May of 1973 the names of the cosmonauts assigned to the preparation and carrying out of the joint Apollo-Soyuz test project, scheduled for mid-1975. Four of the eight men named have not previously flown in space. This announcement, therefore, marks the first time that names of cosmonauts have been released prior to their space missions. These four are: Major Valdimir Dzhanibekov, Captain Yuriy Romanenko, and two civilians, Boris Andreyev and Aleksandr Ivanchenkov.

Biographical data are not as complete for the Russians as they are for the Americans. While the biographical information provided here is the latest available, there is uncertainty as to whether all of it is current. For example, some of the cosmonauts may have been promoted in rank, completed graduate studies, or added to their families without further public announcement.

Preceding sections on American astronauts showed that they joined their respective programs in distinct groups. It is likely that the same is true in the Soviet case, although as explained above, members of such groups become known generally after the fact of flight. Just as the preceding tables showed the names of many astronauts who never achieved space flight for reasons of no flight opportunities or leaving the program, the same is probably true of the Soviet corps. Hence, its total dimensions over the whole period since 1960 can only be surmised. As in the United States program, departures of men may be for many reasons, including administrative convenience, health, and accidental death.

It is unlikely that cosmonauts have been killed in space flights beyond the few names which will follow in this report, because all known flights have recognizable precursor flights, have been matched by advance rumors of impending launch, have required positioning of support ships world-wide, and have sent live television from orbit. To accept the recurring speculative stories of other deaths in flight requires belief in a second, secret launch program using untried hardware, no support ships, and no television from orbit, and in which all crews are always killed. This strains credulity.

It is possible to build a table of the probable dimensions of the total Soviet cosmonaut corps, and this follows (based generally on the research of James E. Oberg, *Flight International*, August 16, 1973).

TABLE 3-1.—*Probable Soviet Cosmonaut Corps Groups*

Group	Year	Category	Estimated total	Flown	Name and year of 1st flight
1	1960	Pilots	12-20	12	Gagarin 1961, Titov 1961, Nikolayev 1962, Popovich 1962, Bykovskiy 1963, Komarov 1964, Belyayev 1965, Leonov 1965, Volynov 1969, Khrunov 1969, Shonin 1969, Gorbato 1969.
2	1961	Women	2-4	1	Tereshkova 1963.
3	1963-64	Test pilots	7-10	7	Beregovoy 1968, Shatalov 1969, Filipchenko 1969, Dobrovolskiy 1971, Lazarev 1973, Artyukhin 1974, Gubarev 1975.
4	1964	Technicians	3-6	3	Feoktistov 1964, Yegorov 1964, Demin 1974.
5	1965	Pilots	2-4	2	Klimuk 1973, Sarafanov 1974.
6	1966-67	Engineers	8-12	8	Yeliseyev 1969, Kubasov 1969, Volkov 1969, Sevast'yanov 1970, Rukavishnikov 1971, Patsayev 1971, Makarov 1973, Grechko 1975.
7	1968-69	Scientists?	0-12	0	Dzhanibekov (), Romanenko ().
8	1970	Pilots	2-6	0	Andreyev (), Ivanchenko ().
9	1970	Engineers	2-6	0	
10	1972	do.	2-6	1	Lebedev 1973.
Possible total corps			40-86	134	

* Have flown.

The Oberg studies of Soviet still and motion picture films have shown men from the early days who clearly dressed like and acted like known cosmonauts in these same scenes; hence, they may represent men who have yet to fly, others who have been dropped from the programs, trainees killed in non-space accidents, or simply instructors and support personnel. In the February 1974 issue of *Spaceflight*, Oberg announced that one of his unidentified cosmonauts was finally identified as Yevgeniy Karpov, then director of the cosmonaut training program.



Boris Dmitriyevich Andreyev; civilian; born 1940, Moscow; married, two children.

Graduated from Moscow's Bauman Higher Technical School, joined a design bureau in 1965 and became a cosmonaut in 1970. He was a member of the second backup crew for the Apollo-Soyuz Test Project.



Yuriy Petrovich Artyukhin; Lieutenant Colonel, Red Air Force; born 1930, Pershutino, near Moscow; married, two children.

Attended Serpukhov Air Force Technical School, served in the Air Force for several years, graduated from Zhukovskiy Air Force Engineering Academy (1958), and joined the cosmonaut Corps in 1963. He was the flight engineer on Soyuz 14/Salyut 3.



Pavel Ivanovich Belyayev; Lieutenant Colonel, Red Naval Air Force; born June 26, 1925, Volgda region; died January 10, 1970 from complications following an operation for stomach ulcers; was married, two children.

Attended the Air Force Academy, and became a cosmonaut in 1960. He was the command pilot of Voskhod 2.



Georgiy Timofeyevich Beregovoy; Major General, Red Air Force; born April 15, 1921, Fedorovka, the Ukraine; married, two children.

Attended Lugansk Military Air School, graduated from the Red Banner Air Force Academy (1956), and became a cosmonaut in 1964. He was the pilot of Soyuz 3 and it is speculated that he is no longer in active training for future flights.



Valeriy Fedorovich Bykovskiy; Colonel, Red Air Force; born August 2, 1934, Pavlovo-Posad near Moscow; married, one child.

Became a cosmonaut in 1960 and attended Zhukovskiy Air Force Engineering Academy, graduating in 1968. He was the backup pilot for Vostok 3, pilot of Vostok 5, and was chief of cosmonaut training for the Apollo-Soyuz mission. It is speculated that he is no longer in training for future flights.



Lev Stepanovich Demin; Colonel, Red Air Force; born 1926, Moscow; married, two children

Graduated from an Air Force communications school, Zhukovskiy Air Force Engineering Academy (1956), earned a degree as candidate of technical sciences (1963), and joined the cosmonaut corps in 1964. He was flight engineer on Soyuz 15.



Georgiy Timofeyevich Dobrovolskiy; Lieutenant Colonel, Red Air Force; born June 1, 1928, Odessa; died June 29, 1971 during Soyuz 11 reentry; was married, two children.

Graduated from the Air Force School at Chuguyevo, and became a cosmonaut in 1963. He was the command pilot of Soyuz 11/Salyut 1.



Vladimir Aleksandrovich Dzhanibekov; Major, Red Air Force; born 1942, South Kazakhstan region; married, two children.

Graduated from the Higher Air School as a pilot-engineer (1965) and became a cosmonaut in 1970. He was a member of the second backup crew for the Apollo-Soyuz Test Project.



Konstantin Petrovich Feoktistov; civilian; born February 26, 1929, Voronezh; married, one child.

Graduated from the Bauman Higher Technical School in Moscow with a master of science degree in engineering (1949) and now holds the degree of doctor of technical sciences. He became a cosmonaut in 1964 and was the technical scientist of Voskhod 1. Dr. Feoktistov has since returned to high-level engineering and played a major role in designing the Salyut space stations



Antoliy Vasilyevich Filipchenko; Colonel, Red Air Force; born February 26, 1928, Davydovka village, Voronezh region; married, two children.

Graduated from Chuguyev Air Force School, from the Air Force Academy (1961) and became a cosmonaut in 1963. He was backup command pilot on Soyuz 4, command pilot on Soyuz 7 and commander of Soyuz 16. He was a member of the primary backup crew for the Apollo-Soyuz Test Project.



Yuriy Alekseyevich Gagarin; Colonel, Red Air Force; born March 9, 1934, Gzhast Rayon, Smolsensk Oblast; died March 27, 1968 in a crash of a jet trainer; was married, two children.

Attended Air School in Orenburg, Zhukovskiy Air Force Engineering Academy, and became a cosmonaut in 1960. He was the pilot of Vostok 1 (first man in space), and backup pilot for Soyuz 1.



Viktor Vasilyevich Gorbatko; Colonel, Red Air Force; born December 3, 1934, Kuban River region, North Caucasus; married, two children.

Entered the Bataysk Air Force School near Rostov in 1953, became a cosmonaut in 1960, and graduated from the Zhukovskiy Air Force Engineering Academy (1968). He was the backup pilot for Voskhod 2, backup pilot for Soyuz 5, and pilot of Soyuz 7.



Georgiy Mikhaylovich Grechko; civilian; born May 25, 1931, Leningrad; married, 2 children.

Graduated from the Leningrad Institute of Mechanics (1955), worked at a design bureau, received a master of technical sciences degree (1967), on the basis of work connected with landing automatic stations on the Moon. A leading spacecraft designer, he became a cosmonaut in 1967. He was the flight engineer for Soyuz 17/Salyut 4.



Aleksey Aleksandrovich Gubarev; Lieutenant Colonel, Red Air Force; born March 29, 1931, Kuibyshev, on the Volga; married, two children.

Graduated from the naval air force school, Gagarin Air Force Academy, and joined the cosmonaut corps in 1963. He was commander of Soyuz 17/Salyut 4.



Valeriy Vasilyevich Illarionov [No other information known].

Illarionov acted as a Houston Capcom during the Apollo-Soyuz mission and was identified as a cosmonaut. The Soviet Academy of Sciences later confirmed this identification, although no personal information was released.



Aleksandr Sergeyevich Ivanchenkov; civilian; born 1940, Ivanteyevka, near Moscow; married, one child.

Graduated from the Moscow Aviation Institute, joined a design bureau in 1964, and became a cosmonaut in 1970. He was a member of the third backup crew for the Apollo-Soyuz Test Project.



Yevgeniy Vasilyevich Khrunov; Colonel, Red Air Force; born September 10, 1933, Prudiy, near Tula; married, one child.

Graduated from Batay Military Aviation College (1956), became a cosmonaut in 1960, graduated from the Zhukovskiy Air Force Engineering Academy (1968), and has since earned a master of science degree. He was the backup pilot for Voskhod 2 and the engineer pilot for both Soyuz 4 and 5, transferring from Soyuz 5 to Soyuz 4 during the flight. He has recently coauthored a book, *Man as Operator in Cosmic Flight*.



Petr Il'ich Klimuk; Lieutenant Colonel, Red Air Force; born July 10, 1942, Komarovka Village, Byelorussia; married, one child.

Graduated from the Higher Air Force College in Chernigov (1964), served in the Air Force, and became a cosmonaut in 1965 (at the age of 23). He was the commander of Soyuz 13 and Soyuz 18 and since 1973 has been a student at the Gagarin Air Force Academy.



Vladimir Milhaylovich Komarov; Engineer Colonel, Red Air Force; born March 16, 1927, Moscow; died April 24, 1967, when Soyuz 1's parachutes tangled during descent; was married, two children.

Attended Moscow Air Force School, Third Sassov Air Force School, Serov Flying School in Bataiski and the Zhukovskiy Air Force Engineering Academy, and became a cosmonaut in 1960. He was backup pilot for Vostok 4, command pilot of Voskhod 1, and pilot of Soyuz 1.



Valeriy Nikolayevich Kubasov; civilian; born January 7, 1935, Vyazniki; married, two children.

Graduated as mechanical engineer for aircraft building from the Moscow Aviation School (1958), received a master of science degree (1968), and joined the cosmonaut corps in 1967. He was the backup technical scientist for Soyuz 5 and flight engineer on Soyuz 6. Mr. Kubasov was flight engineer for the Apollo-Soyuz Test Project.



Vasily Grigor'yevich Lazarev; Lieutenant Colonel, Red Air Force; born February 23, 1928, Altai region of Southern Siberia; married, one child.

Received medical degree specializing in aviation medicine (1952), entered the Air Force school in Chuguyev, since 1954 has been an air force flyer, flight instructor, test pilot and flight equipment tester, and in 1966 became a cosmonaut. He was the backup pilot for Soyuz 9, and commander of Soyuz 12, and of the April 5, 1975 unsuccessful Soyuz flight.



Valentin Vital'yevich Lebedev; civilian; born 1942, Moscow; married, one child.

Graduated from the Moscow Aviation Institute (1966), worked as an engineer in a design bureau, and became a cosmonaut in 1972. He was the flight engineer on Soyuz 13.



Aleksey Arkhipovich Leonov; Major General, Red Air Force; born May 20, 1934, Listvayanka, Altay Kray; married, two children.

Graduated from Chuguyev Air Force School, the Zhukovskiy Air Force Engineering Academy, and became a cosmonaut in 1960. He was the co-pilot of Voskhod 2 (first man to perform extravehicular activity in space), and was command pilot for the Apollo-Soyuz Test Project.



Oleg Grigor'yevich Makarov; civilian; born 1933, Kalinin region near Moscow; married, one child.

Graduated with an engineering degree from Moscow's Higher Technical School (1957), joined a design bureau where he took part in developing the control board of the Vostok spaceship as well as in designing the Voskhod and Soyuz ships, and became a cosmonaut in 1966. He was the backup flight engineer for Soyuz 9 and flight engineer of Soyuz 12, and of the April 5, 1975 unsuccessful Soyuz flight.



Andriyan Grigor'yevich Nikolayev; Major General, Red Air Force; born September 5, 1929, Shorshely, Chuvash Autonomous Republic; married (to cosmonaut Valentina Tereshkova), one child.

Graduated as a pilot from an Air Force school (1954), became a cosmonaut in 1960, and graduated from Zhukovskiy Air Force Engineering Academy (1968). He was backup pilot for Vostok 2, pilot of Vostok 3, backup commander for Soyuz 6, Soyuz 7, and Soyuz 8, commander of Soyuz 9, and possibly backup commander for Soyuz 16.



Viktor Ivanovich Patsayev; civilian; born June 19, 1933, Aktybinsk, Kazakstan; died June 29, 1971 during Soyuz 11 reentry; was married, two children.

Graduated from the Penzensk Industrial Institute (1955), joined the cosmonaut corps in 1969, and earned a master of science degree (1971). He was the test engineer on Soyuz 11/Salyut 1.



Pavel Romanovich Popovich; Colonel, Red Air Force; born October 5, 1930, Uzin, Kiev Oblast; married, two children.

Graduated from an industrial technicum (1951), a military aviation school (1954), Zhukovskiy Air Force Engineering Academy (1968) and became a cosmonaut in 1960. He was the pilot of Vostok 4 and commander of Soyuz 14/Salyut 3. Colonel Popovich has written an autobiographical work entitled *Takeoff In The Morning*.



Yuriy Viktorovich Romanenko; Major, Red Air Force; born 1944, Orenburg Region; married, one child.

Graduated from the Higher Air Force School as a pilot-engineer (1966), and became a cosmonaut in 1970. He was a member of the third backup crew for the Apollo-Soyuz Test Project.



Nikolay Nikolayevich Rukavishnikov; civilian; born September 18, 1932, Tomsk, Siberia; married, one child.

Graduated from the Moscow Engineering and Physics Institute (1957), and joined the cosmonaut corps in 1967. He was the test engineer for Soyuz 10, flight engineer for Soyuz 16, and was a member of the first backup crew for the Apollo-Soyuz Test Project.



Gennadiy Vasiliyevich Sarafanov; Lieutenant Colonel; born January 1, 1942 near Saratov; married, two children.

Graduated from Balashov Higher Air Force Flying School, served in various air units, and became a cosmonaut in 1965. He was the commander of Soyuz 15/Salyut 3.



Vitaliy Ivanovich Sevastyanov; civilian; born July 8, 1935, Krasnouralsk, Sverdlovsk region; married, one child.

Graduated from the Moscow Aviation Institute (1959), earned a master of science degree in engineering from the Institute (1965), and became a cosmonaut in 1967. He was the flight engineer on Soyuz 9 and Soyuz 18/Salyut 4.



Vladimir Aleksandrovich Shatalov; Lieutenant General, Red Air Force; born December 8, 1927, Petropavlovsk, Kazakstan; married, two children.

Graduated from the Kachinsk Air Force College (1949), enrolled in the Air Force Academy in Moscow in 1953, and became a cosmonaut in 1963. He was the backup pilot of Soyuz 3, command pilot of Soyuz 4, commander of Soyuz 8 and commander of Soyuz 10. General Shatalov is currently the Cosmonaut Corps Director of Flight Training.



Georgiy Stepanovich Shonin; Colonel, Red Air Force; born August 3, 1935, Rovenki, the Ukraine; married, two children.

Attended Naval Air Force College, Zhukovskiy Air Force Engineering Academy, and became a cosmonaut in 1960. He was backup commander for Soyuz 5 and commander of Soyuz 6.



Valentina Vladimirovna Tereshkova; Engineer Colonel, Red Air Force; born March 6, 1937, Maslennikovo, Yaroslavl region; married (to cosmonaut Andrian Nikolayev), one child.

Graduated from a textile technical school. She was the pilot of Vostok 6 and is the only woman to have flown in space.



German Stepanovich Titov; Colonel, Red Air Force; born September 11, 1935, Verkhneye Zhilino, Kosikha Rayon, Altay Kray; married, two children.

Graduated from Volgograd Military Aviation College (1957) and became a cosmonaut in 1960. He was the backup pilot for Vostok 1 and pilot for Vostok 2. In 1968 Colonel Titov graduated from the Zhukovskiy Air Force Engineering Academy, and is currently Assistant to the Chief Editor of the Journal of Aviation and Cosmonautics.



Vladislav Nikolayevich Volkov; civilian; born November 23, 1935, Moscow; died June 29, 1971 during Soyuz 11 reentry; was married, one child.

Entered Moscow Aviation Institute in 1953, worked as an engineer, and became a cosmonaut in 1967. He was the flight engineer on Soyuz 7, and flight engineer on Soyuz 11/Salyut 1.



Boris Valentinovich Volynov; Colonel, Red Air Force; born December 18, 1934, Irkutsk, Siberia; married, two children.

Attended Zhukovskiy Air Force Engineering Academy, and became a cosmonaut in 1960. He was the backup pilot for Vostok 5, backup command pilot for Voskhod 1, backup pilot for Soyuz 3, and command pilot of Soyuz 5.



Boris Borisovich Yegorov; Medical Lieutenant, Red Air Force; born November 26, 1937, Moscow; married, one child.

Graduated from the First Medical Institute in Moscow (1961), became a cosmonaut in 1964, received a Doctor of Medicine degree from the Humboldt University of Berlin (1965), and became a candidate of medical sciences in 1967. He was the physiologist for Voskhod 1 and then gave up his temporary cosmonaut role to return to medicine.



Aleksey Stanislovovich Yelisseyev; civilian; born July 13, 1934, Zhizdra; married, one child.

Attended Bauman Technical High School in Moscow, received master of technical science degree in engineering, and became a cosmonaut in 1966. He was the technical scientist for Soyuz 5 and 4, transferring in flight from Soyuz 5 to Soyuz 4, technical scientist for Soyuz 8, and Soyuz 10. He was the Russian flight director for the Apollo-Soyuz Test Project.

TABLE 3-2.—*Summary of Soviet Cosmonauts*

Name	Service/Rank	Flights	Comments
Andreyev	Civilian	-----	-----
Artukhin	AF/Lt. Col.	Soyuz 14/Salyut 3	Died of complications following an operation for stomach ulcers.
Belyayev	Navy AF/Col	Voskhod 2	Probably no longer in active training.
Beregovoy	AF/Maj. Gen.	Soyuz 3	Do.
Bykovskiy	AF/Col	Vostok 5	-----
Demin	do	Soyuz 15	-----
Dobrovolskiy	AF/Lt. Col.	Soyuz 11/Salyut 1	Killed during reentry.
Dzhanibekov	AF/Major	-----	-----
Feoktistov	Civilian	Voskhod 1	Returned to high level design engineering.
Filipchenko	AF/Col	Soyuz 7	-----
Gagarin	do	Soyuz 16	-----
Gorbatko	do	Vostok 1	1st man in space. Killed in crash of a jet trainer.
Grechko	do	Soyuz 7	-----
Gubarev	Civilian	Soyuz 17/Salyut 4	-----
Ilarionov	AF/Lt. Col.	do	-----
Ivanichenkov	(?)	-----	-----
Ivanchenkov	Civilian	-----	-----
Khrunov	AF/Col	Soyuz 4/Soyuz 5	-----
Klimuk	AF/Lt. Col.	Soyuz 13	-----
Komarov	AF/Engineer Col.	Soyuz 18	-----
Kubasov	AF/Engineer Col.	Voskhod 1	Killed in descent of Soyuz 1.
Kubasov	Civilian	Soyuz 1	-----
Lazarev	AF/Lt. Col.	Soyuz 6	-----
Lebedev	AF/Lt. Col.	Soyuz 19	-----
Lebedev	Civilian	Soyuz 12	-----
Lebedev	Civilian	Soyuz 13	-----

Leonov	AF/Maj. Gen.	Voskhod 2	1st man to perform extravehicular activities in space.
Makarov	Civilian	Soyuz 19	
Nikolayev	AF/Major	Soyuz 12	
Putsayev	Civilian	Vostok 3	
Popovich	do	Soyuz 9	
Romanenko	AF/Capt.	Soyuz 11/Salyut 1	Killed during reentry.
Rukavishnikov	Civilian	Vostok 4	
Sarafanov	AF/Col.	Soyuz 14/Salyut 3	
Sevast'yanov	Civilian	Soyuz 10	
Shatalov	AF/Lt. Gen.	Soyuz 16	
Shonin	AF/Col.	Soyuz 15	
Tereshkova	AF/Engineer Col.	Soyuz 9	
Titov	AF/Col.	Soyuz 18	
Volkov	Civilian	Soyuz 4	Currently Cosmonaut Corps Director of Flight Training.
Volynov	AF/Col.	Soyuz 8	
Yegorov	AF/Medical Lt.	Soyuz 10	
Yeliseyev	Civilian	Soyuz 6	
		Vostok 6	Only woman to have flown in space.
		Vostok 2	Currently Assistant to the Chief Editor, Journal of Aviation and Cosmonautics.
		Soyuz 7	Killed during reentry.
		Soyuz 11/Salyut 1	
		Soyuz 5	
		Voskhod 1	
		Soyuz 4/Soyuz 5	Returned to medicine; no longer in active training for future flights.
		Soyuz 8	
		Soyuz 10	

CHAPTER FOUR

COMPARATIVE DATA ON AMERICAN AND SOVIET SPACEFLIGHTS

Table 4-1a compares the manned spaceflights of the United States and the Soviet Union. The table is set up in chronological order with the name of the spacecraft in the left column together with its popular label or call sign, if any. The next columns give the launch date, the crew, the payload weight in kilograms, the flight duration, and the national cumulative man hours. The figures for the national cumulative man hours are compiled by taking the cumulative man hours through the previous flight of the same country and adding the additional man hours of the new flight. If there was more than one man on the flight, the flight time is multiplied by the number of men. The last column on the right gives the highlights of the different flights. Table 4-1b gives a time line of these manned flights.

Table 4-2 (page 171) lists the prime and backup crew members of the various manned spaceflights by program.

Table 4-3 (page 176) lists the hours spent in space flight (other than the X-15) by each astronaut or cosmonaut.

Table 4-4 (page 178) compares the various manned flight programs by number of flights, number of men, and man hours; reconciles the count of 43 U.S. astronauts who have made 31 flights in 31 spacecraft; and reconciles the 34 Soviet cosmonauts who have made 27 flights in 27 spacecraft.

Table 4-5 (page 179) elaborates upon the United States portion of the fourth chart by providing the number of men chosen in each of the various astronaut programs. This chart also serves to further reconcile the 28 NASA astronauts remaining on active flight status; the 34 men who have left the NASA corps for one reason or another; the 3 men on inactive status; and the 8 NASA and 4 other astronauts who have died while in their respective programs.

Table 4-6 (page 180) lists the astronauts and cosmonauts who have died either in their program or after leaving it, date and cause of death.

TABLE 4-1a.—U.S. and U.S.S.R. manned spaceflights

Name of spacecraft	Launch date	Crew	Payload weight (kg)	Flight time (hrs.:min.)	National cumulative man-hours (hrs.:min.)	Highlights
1961						
Vostok 1, Kedr (cedar)	Apr. 12	Gagarin	4,725	1:48	1:48	1st manned flight.
Mercury-Redstone 3, Freedom 7	May 5	Shepard	1,290	:15	:15	1st U.S. flight, suborbital.
Mercury-Redstone 4, Liberty Bell 7	July 21	Grissom	1,286	:16	:31	Suborbital; capsule sank after landing.
Vostok 2, Oryel (Eagle)	Aug. 6	Titov	4,731	25:18	27:06	1st flight exceeding 24 hours.
1962						
Mercury-Atlas 6, Friendship 7	Feb. 20	Glenn	1,355	4:55	5:26	1st American to orbit.
Mercury-Atlas 7, Aurora 7	May 24	Carpenter	1,349	4:56	10:22	Landed 250 mi (402 km) from target.
Vostok 3, Sokol (Falcon)	Aug. 11	Nikolayev	4,722	94:22	121:28	1st dual mission.
Vostok 4, Berkut (Golden Eagle)	Aug. 12	Popovich	4,728	70:57	192:25	In near coorbit, made pass at 4 miles (6.5 km); sometimes considered first rendezvous.
Mercury-Atlas 8, Sigma 7	Oct. 3	Schirra	1,373	9:13	19:35	Landed 5 mi (8 km) from target.
1963						
Mercury-Atlas 9, Faith 7	May 15	Cooper	1,376	34:20	53:55	1st U.S. flight exceeding 24 hrs.
Vostok 5, Yastreb (Hawk)	June 14	Bykovskiy	4,720	119:06	311:31	Second dual mission.
Vostok 6, Chayka (Sea Gull)	June 16	Tereshkova	4,713	70:50	382:21	1st woman to orbit. Made pass at 3 mi (5 km).
1964						
Voskhod 1, Rubin (Ruby)	Oct. 12	Komarov, Yegorov, Feoktistov	5,320	24:17	455:12	1st 3 man crew.

1965

Voskhod 2, Almaz (Diamond).	Mar.	18	Belyayev, Leonov.	5, 682	26:02	507:16	1st extravehicular (EVA)—Leonov.	activity
Gemini-Titan 3, Molly Brown.	Mar.	23	Grissom (2), Young	3, 225	4:53	63:41	1st U.S. 2 man crew; first manual maneuvers in space.	
Gemini-Titan 4	June	3	McDivitt, White.	3, 574	97:56	259:33	1st U.S. EVA—White.	
Gemini-Titan 5	Aug.	21	Cooper (2), Conrad.	3, 605	190:55	641:23	Longest duration manned flight to date; performed phantom rendezvous.	
Gemini-Titan 7	Dec.	4	Borman, Lovell.	3, 663	330:35	1, 302:33	Longest duration manned flight to date; target for rendezvous.	
Gemini-Titan 6	Dec.	15	Schirra (2), Stafford.	3, 546	25:51	1, 354:15	Rendezvous within 1 ft (30 cm) of Gemini 7, and conducted sustained coorbit.	

1966

Gemini-Titan 8	Mar.	16	Armstrong, Scott.	3, 788	10:41	1, 375:37	Rendezvous and 1st docking of 2 orbiting spacecraft (with Agena 8 target). Emergency recovery after developing high rate of spin.	
Gemini-Titan 9	June	3	Stafford (2), Cernan.	3, 750	72:21	1, 520:19	EVA—Cernan (2 hrs. 07 min.) Rendezvous performed 3 times but no docking because shroud not jettisoned on target.	
Gemini-Titan 10	July	18	Young (2), Collins.	3, 741	70:47	1, 661:53	1st dual rendezvous (with Agena 8 target and Agena 10 target); 2 EVA—Collins; Retrieved by EVA an experiment on Agena 8 target. Used target as propulsion unit following docking.	
Gemini-Titan 11	Sept.	12	Conrad (2), Gordon.	3, 860	71:17	1, 804:27	1st initial orbit rendezvous; 1st tethered flight; highest Earth orbit to date (853 mi) (1,372 km) conducted; EVA—Gordon (44 min). 2 rendezvous and 4 dockings.	
Gemini-Titan 12	Nov.	11	Lovell (2), Aldrin.	3, 763	94:35	1, 993:37	Longest EVA; Rendezvous and 3 dockings; total 3 EVA (Aldrin—5 hrs. 37 min.).	

TABLE 4-1a.—*U.S. and U.S.S.R. manned spaceflights—Continued*

Name of spacecraft	Launch date	Crew	Payload weight (kg)	Flight time (hrs.:min.)	National cumulative man-hours (hrs.:min.)	Highlights
1967						
(Apollo 4) (AS 204)	Jan.	27	Grisson (3), White Chaffee.	20, 412	[Not a space flight, but date of fatal fire on pad during test preliminary to later scheduled flight]	All 3 astronauts asphyxiated; the capsule was damaged, but the launch vehicle was unharmed and later flew unmanned as Apollo 5.
Soyuz 1, Rubin (Ruby)	April	23	Komarov (2)	6, 450	533:53	1st man killed in space flight—parachutes tangled in landing.
1968						
Apollo-Saturn 205, Apollo 7.	Oct.	11	Schirra (3), Eisele, Cunningham.	20, 569	2, 774:04	1st United States 3-man mission. Rendezvous with 3d stage.
Soyuz 3, Argon (Argon)	Oct.	26	Beregovoy	6, 575	628:44	Maneuvered to rendezvous near unmanned Soyuz 2.
Apollo-Saturn 503, Apollo 8.	Dec.	21	Borman (2), Lovell, Anders.	43, 663	3, 215:07	1st manned orbits of the Moon; 1st manned departure from Earth's sphere of influence; highest speed of manned flight.
1969						
Soyuz 4, Amur	Jan.	14	Shatalov, (Khruinov), (Yeliseyev).	6, 625	71:23	Rendezvous and 1st docking of 2 manned ships. 1st receipt of crew from another ship.
Soyuz 5, Baykal	Jan.	15	Volynov, Khruinov, Yeliseyev.	6, 585	72:56	1st transfer of crew to another ship; target for rendezvous and docking.
Apollo-Saturn 504, Apollo 9, Gumbdrop and Spider.	Mar.	3	McDivitt (2), Scott, Schweickart.	43, 136	3, 938:10	Tested the propulsion, rendezvous, and docking capabilities of the lunar excursion module.

Apollo-Saturn 505, Apollo 10, Charlie Brown and Snoopy.	May	18	Stafford (3), Young (3), Cernan (2).	48, 638	192:03	4, 514:19	Testing of lunar excursion module in lunar orbit.
Apollo-Saturn 506, Apollo 11, Columbia and Eagle.	July	16	Armstrong (2), Collins (2), Aldrin.	49, 698	195:19	5, 100:16	Landed on moon and returned safely.
Soyuz 6, Antey (Antaeus) -	Oct.	11	Shonin, Kubasov -	6, 577	118:42	1, 106:05	Tested welding in space rendezvous with Soyuz 7.
Soyuz 7, Buran (Snowstorm).	Oct.	12	Filipchenko, Volkov, Gorbalko.	6, 570	118:41	1, 462:08	Earth resources survey rendezvous target.
Soyuz 8, Granit (Granite) -	Oct.	13	Shatalov (2), Yeliseyev (2) -	6, 646	118:50	1, 699:48	Earth resources survey rendezvous with Soyuz 7.
Apollo-Saturn 507, Apollo 12, Yankee Clipper and Intrepid.	Nov.	14	Conrad (3), Gordon (2), Bean.	49, 804	244:36	5, 834:04	2d lunar landing; returned safely.
1970							
Apollo-Saturn 508, Apollo 13, Odyssey and Aquarius.	Apr.	11	Lovell (4), Swigert, Haise -	49, 990	142:55	6, 262:49	3d lunar landing attempt aborted due to explosion in service module.
Soyuz 9, Sokol (Falcon) -	June	1	Nikolayev (2), Sevastyanov.	6, 500	424:59	2, 549:46	Duration record of 17 days 16 hr 59 min for medical purposes.
1971							
Apollo-Saturn 509, Apollo 14, Kitty Hawk and Antares.	Jan.	31	Shepard (2), Roosa, Mitchell.	46, 346	216:02	6, 910:55	3d lunar landing; returned safely.
Salyut-1 -	Apr.	19	-	18, 596	-	-	Launched unmanned docking target for Soyuz 10 and 11.
Soyuz 10, Granit (Granite) -	Apr.	22	Shatalov (3), Yeliseyev (3), Rukavishnikov.	6, 575	47:46	2, 693:04	1st crew to dock with Salyut space station, but no transfer into station.
Soyuz 11, Yantar (Amber) -	June	6	Dobrovolskiy, Patsayev, Volkov (2).	6, 575	570:22	4, 404:10	2d crew to reach Salyut space station, 1st to enter it. Set duration record of 23 days 18 hr 22 min. Killed upon reentry due to depressurization of spacecraft.
Apollo-Saturn 510, Apollo 15, Endeavor and Falcon.	July	26	Scott (3), Worden, Irwin -	52, 759	295:12	7, 796:31	4th lunar landing; returned safely. 1st men to drive on Moon (lunar rover vehicle).

TABLE 4-1a.—*U.S. and U.S.S.R. manned spaceflights—Continued*

Name of spacecraft	Launch date	Crew	Payload weight (kg)	Flight time (hrs.:min.)	National cumulative man-hours (hrs.:min.)	Highlights
1972						
Apollo-Saturn 511, Apollo 16, Casper and Orion.	Apr. 16	Young (4), Duke.	51, 571	265:51	8, 594:04	5th lunar landing; returned safely. 2d men to drive on Moon (lunar rover vehicle).
Apollo-Saturn 512, Apollo 17, America and Challenger.	Dec. 7	Cernan (3), Evans, Schmitt.	51, 808	301:52	9, 499:40	6th lunar landing; returned safely. Last manned Moon landing of the Apollo program. Used lunar roving vehicle.
1973						
Skylab 1, Apollo-Saturn 513, with Apollo-Saturn 212.	May 14		74, 783	-----	-----	Launched unmanned for later use by crews of SL-2, 3, 4.
Skylab 2, Apollo-Saturn 206, CSM 116.	May 25	Conrad (4), Kerwin, Weitz.	13, 978	672:50	11, 518:10	Crew repaired damage to and occupied Skylab 1.
Skylab 3, Apollo-Saturn 207, CSM 117.	July 28	Bean (3), Garriott, Lousma.	14, 167	1, 472:09	15, 799:37	Crew made further repairs to and occupied Skylab 1.
Soyuz 12, Uraly (Urals)----	Sept. 27	Lazarev, Makarov.	6, 575	47:16	4, 498:42	Checkout of engineering fixes.
Skylab 4, Apollo-Saturn 208, CSM 118.	Nov. 11	Carr, Gibson, Pogue.	14, 900	2, 017:16	21, 851:25	Occupied Skylab 1 and set world duration record.
Soyuz 13, Kavkaz (Caucasus).	Dec. 18	Klimuk, Lebedev.	6, 575	188:55	4, 876:32	Astrophysical biological and earth resources experiments.

1974

Salyut 3	June	24	18,500	-----	-----	Unmanned docking target for Soyuz 14 and 15.
Soyuz 14, Berkut (Golden Eagle).	July	3	6,570	377:30	5,631:32	Occupied Salyut 3.
Soyuz 15, Dunay (Danube)	Aug.	26	6,570	48:12	5,727:56	Unsuccessful attempt to dock with Salyut 3.
Soyuz 16, Buran (Snowstorm).	Dec.	2	6,570	142:24	6,012:44	ASTP precursor flight to check out new designs for Soyuz craft.
Salyut 4	Dec.	26	18,500	-----	-----	Unmanned docking target for Soyuz 17 (and perhaps others).

1975

Soyuz 17, Zenit (Zenith)	Jan.	10	6,570	709:20	7,431:24	Occupied Salyut 4, set Soviet duration record.
April 5 Anomaly, Uraliy (Urals).	Apr.	5	6,570	:20	7,432:04	Mission aborted before reaching orbit due to 3d stage malfunction; intended to dock with Salyut 4.
Soyuz 18, Kavkaz (Caucas).	May	24	6,800	1,511:20	10,454:44	Occupied Salyut 4, set Soviet duration record.
Soyuz 19, Soyuz (Union)	July	15	6,800	142:31	10,739:46	Docked with U.S. Apollo capsule. 1st international docking in space.
Apollo-Soyuz	July	15	14,743	217:28	22,503:49	Docked with Soviet Soyuz capsule. 1st international docking in space.

TABLE 4-1b

TIME LINE OF U.S. AND U.S.S.R. MANNED SPACE MISSIONS

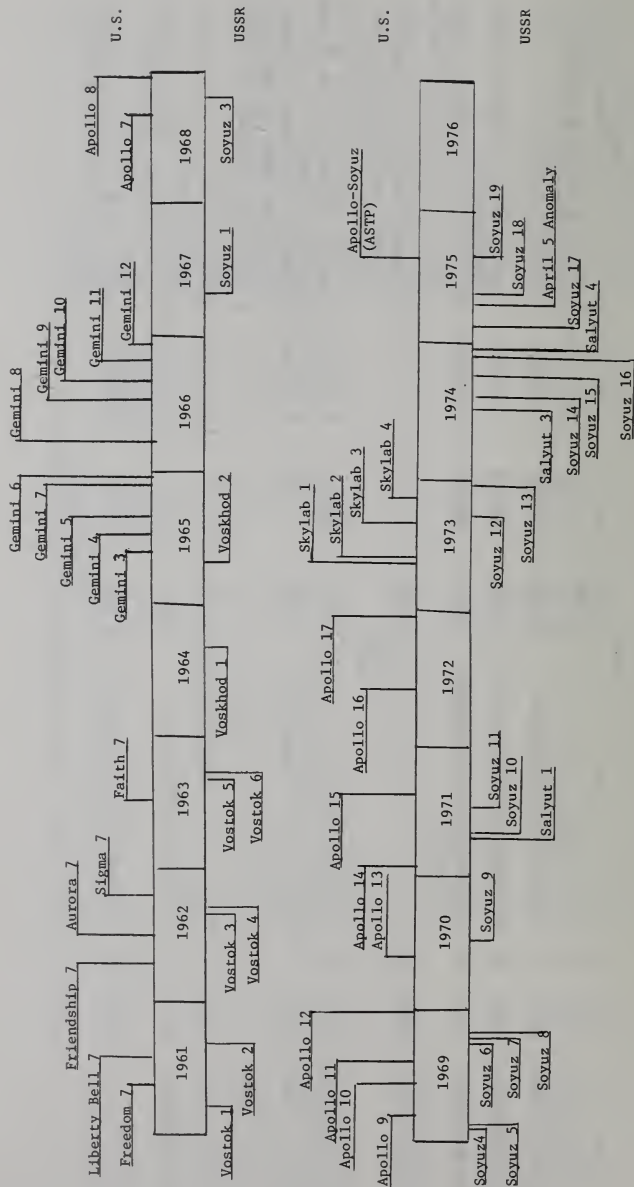


TABLE 4-2a.—U.S. Manned Spaceflight Crew Members by Program

Program	Prime crew		Backup crew	
	Command pilot	Pilot	Command pilot	Pilot
Mercury-Redstone:				
3-----	Shepard-----		Glenn-----	
4-----	Grissom-----		Glenn-----	
Mercury-Atlas:				
6-----	Glenn-----		Carpenter-----	
7-----	Carpenter-----		Schirra-----	
8-----	Schirra-----		Cooper-----	
9-----	Cooper-----		Shepard-----	
Gemini-Titan:				
3-----	Grissom-----	Young-----	Schirra-----	Stafford
4-----	McDivitt-----	White-----	Borinan-----	Lovell
5-----	Cooper-----	Conrad-----	Armstrong-----	See
7-----	Borinan-----	Lovell-----	White-----	Collins
6-----	Schirra-----	Stafford-----	Grissom-----	Young
8-----	Armstrong-----	Scott-----	Conrad-----	Gordon
9-----	Stafford-----	Cernan-----	Lovell-----	Aldrin
10-----	Young-----	Collins-----	Bean-----	Williams
11-----	Conrad-----	Gordon-----	Armstrong-----	Anders
12-----	Lovell-----	Aldrin-----	Cooper-----	Cernan

TABLE 4-2a.—*U.S. Manned Spaceflight Crew Members by Program—Continued*

Program	Prime crew			Backup crew		
	Commander	Command module pilot	Lunar module pilot	Commander	Command module pilot	Lunar module pilot
Apollo-Saturn: 204 ¹ 7 8 9 10 11 12 13 14 15 16 17	Grissom	White	Chaffee	Schirra	Eisele	Cunningham
	Schirra	Eisele	Cunningham	Stafford	Young	Cernan
	Borman	Lovell	Anders	Armstrong	Aldrin	Haise
	McDivitt	Scott	Schweickart	Gordon	Gordon	Bean
	Stafford	Young	Cernan	Cooper	Eisele	Mitchell
	Aldrin	Collins	Aldrin	Lovell	Anders	Haise
	Armstrong	Gordon	Bean	Scott	Worden	Irwin
	Conrad	Swigert ²	Haise	Young	Mattingly ²	Duke
	Lovell	Roosa	Mitchell	Cernan	Evans	Engle
	Shepard	Worden	Irwin	Gordon	Brand	Schmitt
	Scott	Mattingly	Duke	Haise	Roosa	Mitchell
	Young	Evans	Schmitt	Young	Roosa	Duke
	Cernan					
	Commander	Pilot	Science pilot	Commander	Pilot	Science pilot
	Conrad	Weitz	Kerwin	Schweickart	McCandless	Musgrave
	Bean	Lousma	Garriott	Brand	Lenoir	Lind
	Carr	Pogue	Gibson	Brand	Lenoir	Lind
Skylab: 2 3 4						
	Commander	Command module pilot	Docking module pilot	Commander	Command module pilot	Docking module pilot
Apollo-Soyuz	Stafford	Brand	Slayton	Bean	Evans	Lousma

¹ Not a spaceflight; 3 astronauts died in fire during preflight test.² Mattingly was replaced by Swigert as command module pilot on Apollo 13 when it was discovered he had been exposed to measles.

TABLE 4-2b.—U.S.S.R. manned spaceflight crew members by program

Program	Prime crew		Backup crew	
	Command pilot	Pilot (other)	Command pilot	Pilot (other)
Vostok:				
1.	Gagarin		Titov	
2.	Titov		Nikolayev	
3.	Nikolayev		Bykovskiy	
4.	Popovich		Komarov	
5.	Bykovskiy		Volynov	
6.	Tereshkova		(?)	
Voskhod:				
1.	Komarov	Yegorov (physiologist).	Volynov	(?)
2.	Belyayev	Leonov	(?)	Khrunov, Gorbatko
Soyuz:				
1.	Komarov		Gagarin	
3.	Bergovoy		Shatalov	
4.	Shatalov	Khrunov (engineer pilot).	Filipchenko	
5.	Volynov	do.	Shonin	Kubasov (technical scientist).
6.	Shonin	Kubasov (flight engineer).	Nikolayev	(?)
7.	Filipchenko	Volkov (flight engineer).	do	(?)
			Gorbatko	(?)

8	Shatalov	Yeliseyev (technical scientist).	-----do-----	(?)	-----
9	Nikolayev	Sevastyanov (flight engineer).	Lazarev	-----	Makarov (flight engineer).
10	Shatalov	Yeliseyev (technical scientist).	(?)	(?)	(?)
11	Dobrovolskiy	Volkov (flight engineer).	(?)	(?)	(?)
12	Lazarev	Makarov (flight engineer).	(?)	(?)	-----
13	Klimuk	Lebedev (flight engineer).	(?)	(?)	-----
14	Popovich	Artyukhin (flight engineer).	(?)	(?)	-----
15	Sarafanov	Demin (flight engineer).	(?)	(?)	-----
16	Filipechenko	Rukavishnikov (flight engineer).	(?)	(?)	-----
17	Gubarev	Grechko (flight engineer).	(?)	(?)	-----
Apr. 5 anomaly. ¹	Lazarev	Makarov (flight engineer).	(?)	(?)	-----
18	Klimuk	Sevastyanov (flight engineer).	(?)	(?)	-----
19 (ASTP).	Leonov	Kubasov (flight engineer).	Filipechenko, (3d) Dzanibekov, (4h) Romanenko.	Rukavishnikov, (3d) Andreyev, (4h) Ivanchenkov.	

¹ Mission was aborted before reaching orbit due to 3rd stage malfunction. Although its number would have been 18 if successful, the Soviets designated it the Apr. 5 anomaly.

TABLE 4-3.—*Comparative Time Spent on Space Missions*

Name	Nationality	Flights	Total hours: minutes
Carr.....	United States.....	1	2, 017:16
Gibson.....	do.....	1	2, 017:16
Pogue.....	do.....	1	2, 017:16
Sevastyanov.....	U.S.S.R.....	2	1, 936:19
Klimuk.....	U.S.S.R.....	2	1, 700:15
Bean.....	United States.....	2	1, 671:45
Garriott.....	do.....	1	1, 427:09
Lousma.....	do.....	1	1, 427:09
Conrad.....	do.....	4	1, 179:38
Lovell.....	do.....	4	715:04
Grechko.....	U.S.S.R.....	1	709:20
Gubarev.....	U.S.S.R.....	1	709:20
Volkov.....	U.S.S.R.....	2	689:03
Kerwin.....	United States.....	1	672:50
Weitz.....	do.....	1	672:50
Dobrovolskiy.....	U.S.S.R.....	1	570:22
Patsayev.....	U.S.S.R.....	1	570:22
Cernan.....	United States.....	3	566:16
Scott.....	do.....	3	546:54
Young.....	do.....	4	533:34
Nikolayev.....	U.S.S.R.....	2	519:22
Stafford.....	United States.....	4	507:40
Borman.....	do.....	2	477:36
Popovich.....	U.S.S.R.....	2	448:27
Artyukhin.....	U.S.S.R.....	1	377:30
McDivitt.....	United States.....	2	338:57
Gordon.....	do.....	2	315:53
Evans.....	do.....	1	301:52
Schmitt.....	do.....	1	301:52
Schirra.....	do.....	3	295:13
Irwin.....	do.....	1	295:12
Worden.....	do.....	1	295:12
Aldrin.....	do.....	2	289:54
Collins.....	do.....	2	266:06
Mattingly.....	do.....	1	265:51
Duke.....	do.....	1	265:51
Kubasov.....	U.S.S.R.....	2	261:13
Filipchenko.....	U.S.S.R.....	2	261:05
Eisele.....	United States.....	1	260:09
Cunningham.....	do.....	1	260:09
Schweickart.....	do.....	1	241:01
Shatalov.....	U.S.S.R.....	3	237:59
Cooper.....	United States.....	2	225:15
Brand.....	do.....	1	217:28
Slayton.....	do.....	1	217:28
Shepard.....	do.....	2	216:17
Mitchell.....	do.....	1	216:02
Roosa.....	do.....	1	216:02
Yeliseyev.....	U.S.S.R.....	3	214:25
Armstrong.....	United States.....	2	206:00
Rukavishnikov.....	U.S.S.R.....	2	190:10
Lebedev.....	U.S.S.R.....	1	188:55
Leonov.....	U.S.S.R.....	2	168:33
Anders.....	United States.....	1	147:01
Haise.....	do.....	1	142:55
Swigert.....	do.....	1	142:55
Bykovskiy.....	U.S.S.R.....	1	119:06
Shonin.....	U.S.S.R.....	1	118:42
Gorbatko.....	U.S.S.R.....	1	118:41
White.....	United States.....	1	97:56
Beregovoy.....	U.S.S.R.....	1	94:51

TABLE 4-3.—*Comparative Time Spent on Space Missions*—Continued

Name	Nationality	Flights	Total hours: minutes
Volynov.....	U.S.S.R.....	1	72:56
Tereshkova.....	U.S.S.R.....	1	70:50
Komarov.....	U.S.S.R.....	2	50:54
Demin.....	U.S.S.R.....	1	48:12
Sarafanov.....	U.S.S.R.....	1	48:12
Khrunov.....	U.S.S.R.....	1	47:49
Lazarev.....	U.S.S.R.....	2	47:36
Makarov.....	U.S.S.R.....	2	47:36
Belyayev.....	U.S.S.R.....	1	26:02
Titov.....	U.S.S.R.....	1	25:18
Yegorov.....	U.S.S.R.....	1	24:17
Feoktistov.....	U.S.S.R.....	1	24:17
Grissom.....	United States.....	2	5:09
Carpenter.....	do.....	1	4:56
Glenn.....	do.....	1	4:55
Gagarin.....	U.S.S.R.....	1	1:48
Total:			
United States (43 people).....		31	22,503:49
U.S.S.R. (34 people).....		27	10,739:46
World (77 people).....		58	33,243:35

TABLE 4-4.—*Manned Spaceflights by Program*

Program	Number of flights	Number of persons	Person-hours
Skylab (United States)-----	3	9	12,351:45
Soyuz (U.S.S.R.)-----	19	39	10,232:30
Apollo (United States)-----	11	33	7,506:03
Gemini (United States)-----	10	20	1,939:42
Apollo-Soyuz (United States)-----	1	3	652:24
Vostok (U.S.S.R.)-----	6	6	382:21
Voskhod (U.S.S.R.)-----	2	5	124:55
Mercury-Atlas (United States)-----	4	4	53:24
Mercury-Redstone (United States)-----	2	2	:31
Total-----	58	121	33,243:35
U.S. total (43)-----	31	71	22,503:49
4 people, 4 times-----		16	-----
3 people, 3 times-----		9	-----
10 people, 2 times-----		20	-----
26 people, 1 time-----		26	-----
U.S.S.R. total (34)-----	27	50	10,739:46
2 people, 3 times-----		6	-----
12 people, 2 times-----		24	-----
20 people, 1 time-----		20	-----

TABLE 4-5.—Summary Table of U. S. Astronaut Program

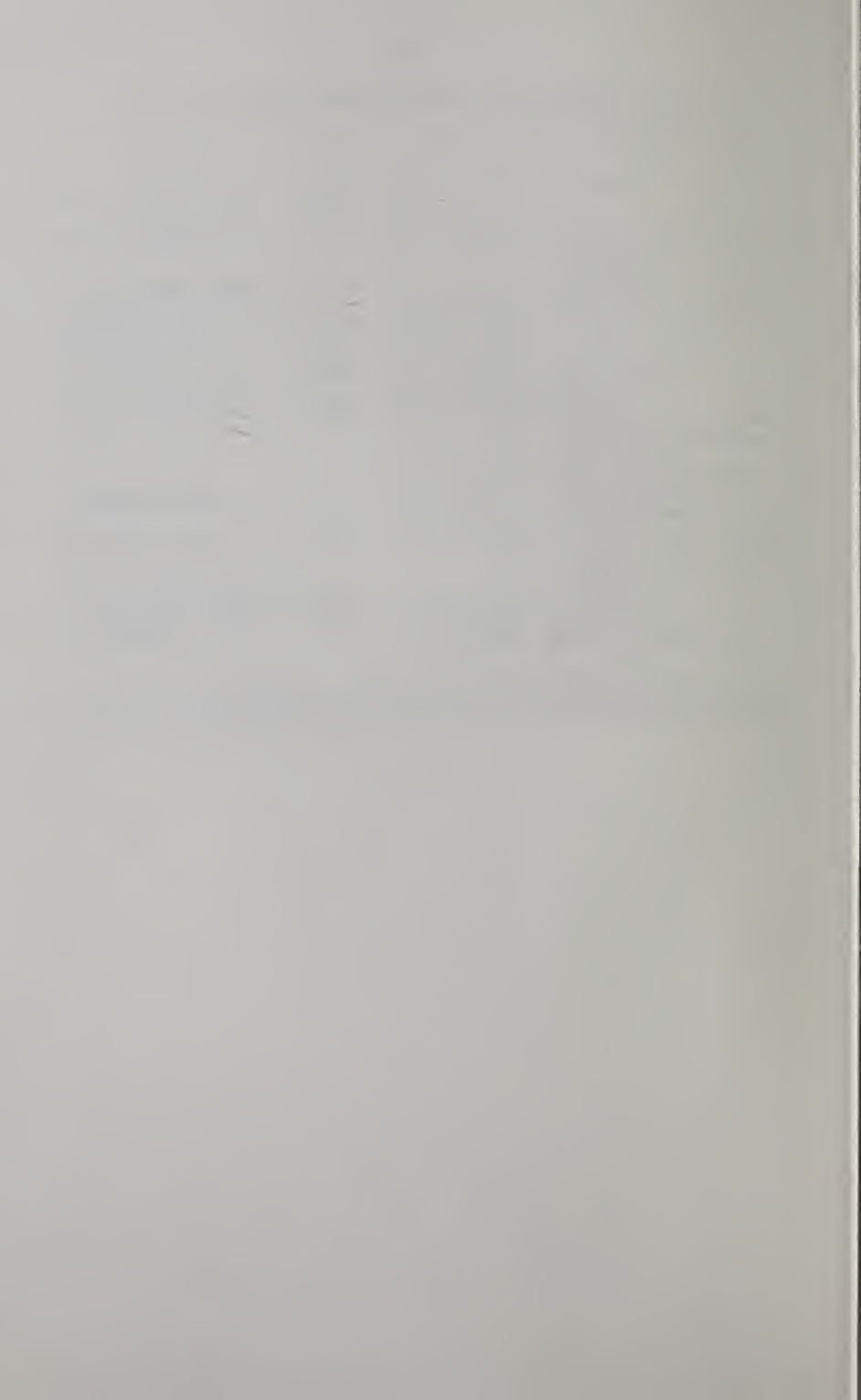
Group/year chosen	Number named	Have flown missions	Died while in program	Withdrew from program	Transferred to other programs	Left due to cancellation	Remaining in program (active)	Remaining in program (inactive)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ASTRONAUTS								
I—1959.....	7	7	1	5	0	0	1	0
II—1962.....	9	8	2	6	0	0	1	0
III—1963.....	14	10	4	8	0	0	1	1
IV—1965.....	6	4	0	4	0	0	2	0
V—1966.....	19	14	1	6	0	0	11	1
VI—1967.....	11	0	0	5	0	0	5	1
VII—1969.....	7	0	0	0	0	0	7	0
Subtotal.....	73	43	8	34	0	0	28	3
X-15 ASTRONAUTS								
I—?.....	12	8	2	0	1	2	8	0
X-20 DYNA-SOAR ASTRONAUTS								
I—1962.....	6	0	0	0	2	2	3	0
					3	1		
MANNED ORBITING LABORATORY (MOL) ASTRONAUTS								
I—1965.....	8	0	0	0	2	1	6	0
					1	1		
II—1966.....	5	0	0	0	1	5	0	0
III—1967.....	4	0	1	0	1	1	2	0
Subtotal.....	17	0	1	0	8	8	8	0
Totals.....	4	108	51	11	34	13	19	28
								3

¹ To NASA. ² To X-15. ³ To MOL. ⁴ Reflects only 94 different individuals, 14 of whom were named to more than 1 program.

TABLE 4-6.—*List of Deceased Astronauts and Cosmonauts*¹

Name/country	Program	Date	Cause of Death
Adams/United States----	MOL X-15	Nov. 15, 1967	X-15 crash.
Bassett/United States----	NASA	Feb. 28, 1966	Jet crash.
Belyayev/U.S.S.R.-----		Jan. 10, 1970	Complications from surgery.
Chaffee/United States----	NASA	Jan. 27, 1967	Apollo 204 fire.
Dobrovolskiy/U.S.S.R.-----		June 29, 1971	Soyuz 11 depressurization.
Freeman/United States----	NASA	Oct. 31, 1964	Jet crash.
Gagarin/U.S.S.R.-----		Mar. 27, 1968	Do.
Givens/United States----	NASA	June 6, 1967	Automobile accident.
Grissom/United States----	NASA	Jan. 27, 1967	Apollo 204 fire.
Komarov/U.S.S.R.-----		Apr. 24, 1967	Soyuz 1 crash.
Lawrence/United States--	MOL	Dec. 8, 1967	Jet crash.
McKay/United States----	X-15	May 1975	Complications from 1962 X-15 crash; after leaving program.
Patsayev/U.S.S.R.-----		June 29, 1971	Soyuz 11 depressurization.
Rogers/United States----	X-20	Sept. 13, 1967	F-105 explosion; after leaving program.
See/United States-----	NASA	Feb. 28, 1966	Jet crash.
Taylor/United States----	MOL	Sept. 1970	Jet crash; after leaving program.
Walker/United States----	X-15	June 8, 1966	Jet crash.
White/United States----	NASA	Jan. 27, 1967	Apollo 204 fire.
Williams/United States---	NASA	Oct. 15, 1967	Jet crash.
Volkov/U.S.S.R.-----		June 29, 1971	Soyuz 11 depressurization.

¹ The list of deceased cosmonauts is believed to be incomplete. It includes all publicly announced deaths, but a highly placed Russian space official indicated privately to his American counterpart in April 1974 that eight Soviet cosmonauts in training have been killed in aircraft or automobile accidents since 1960, before having had any opportunity to fly in space.





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